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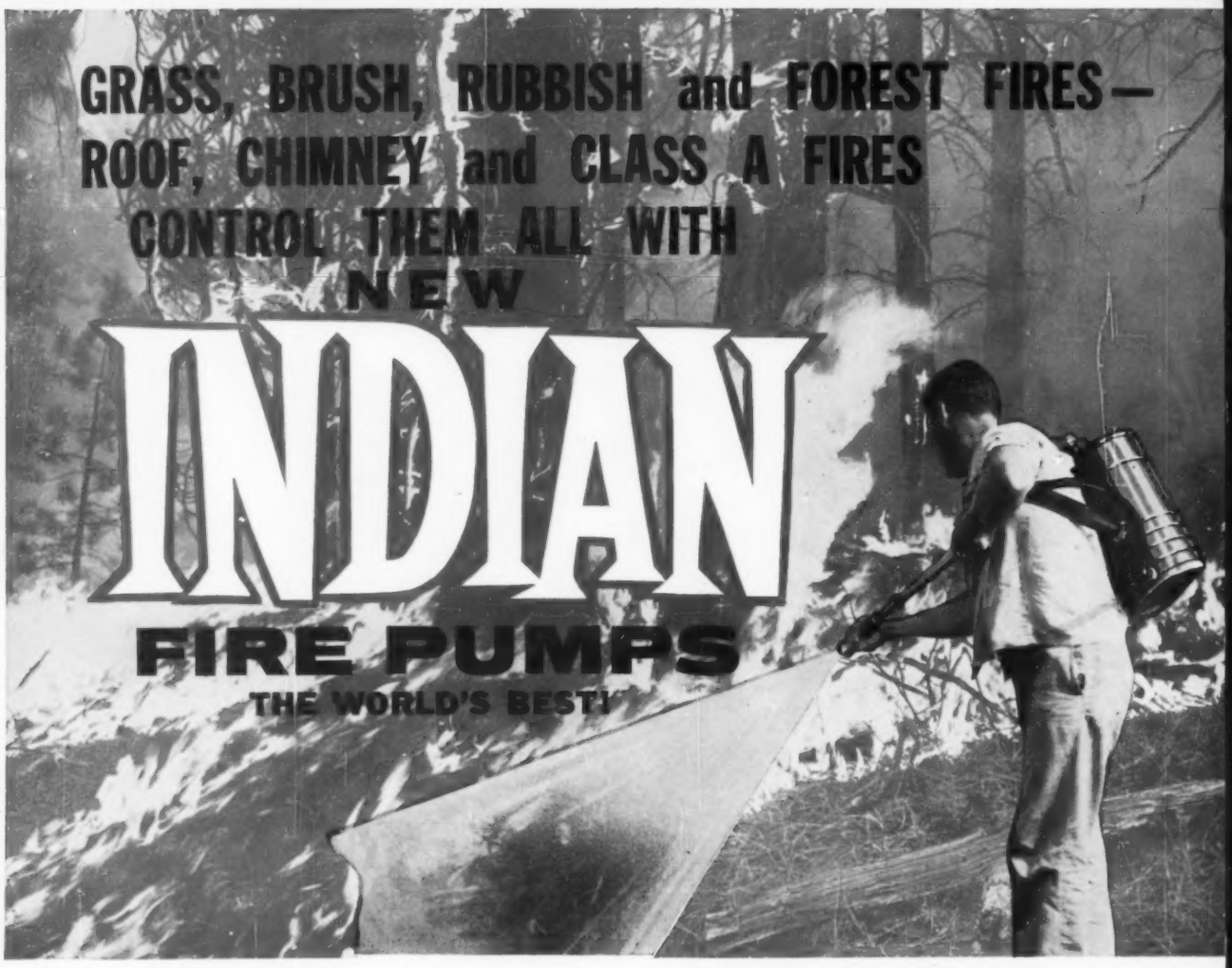

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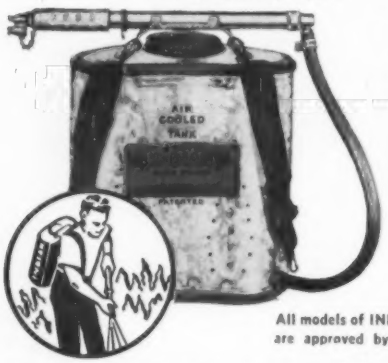

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Photo by James Hughes, Washington State Department of Natural Resources

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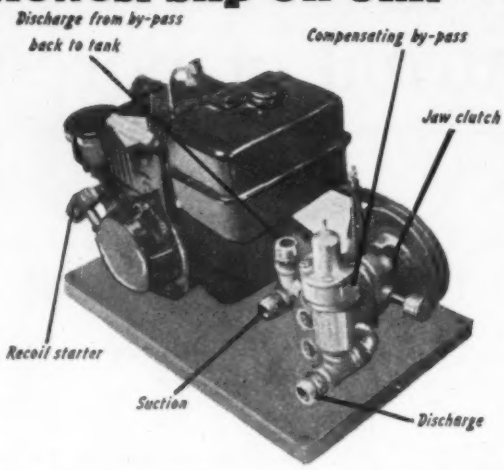

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Twenty Years of Commercial Crop Tending in Immature Douglas-Fir

William A. Tinney, A. N. Quam and A. R. O'Donnell

LOGGING of old-growth Douglas-fir took place first in the vicinity of Puget Sound. As a result, there are in this general area extensive stands of second growth approaching merchantability or already in that state. Need for practical know-how in managing such stands is obvious. Accordingly, the experience gained over 20 years in handling the 93-acre forest property[1] of William L. Bayh in Snohomish County, Washington, should be of considerable interest. So far as known, the 1939-1940 operation in this tract was the first commercial thinning in the Douglas-fir region.

History of Cuttings

In 1939, when the project was undertaken at the suggestion of the Soil Conservation Service, as a part of its program of working with small woodland owners, commercial thinnings in the Douglas-fir region were unheard of and even ridiculed. Keep in mind that this was still the day of railroad logging, that truck logging was in its infancy, and anyone so bold as to advocate seriously that Douglas-fir could be thinned commercially was viewed with suspicion.

True, there were some small research plots that had been thinned to varying degrees, and many would agree that, *if* it were practical to thin, there would be silvicultural benefits. But how to go about extracting commercial products without ruining the residual stand was not known. Nor was it known whether the stand left after commercial thinning would live and grow, or whether there would be enough profit to the owner to make the operation worth while.

The stand available for thinning was about 60 years old (having originated after fire). It was comprised primarily of Douglas-fir, with some western redcedar and western hemlock in mixture. Prior to 1939, five different operators had worked in the stand salvaging old trees that had survived the fire and doing some high-grading for logs, poles and piling in the second growth. Unfortunately there is no record of the volume of timber removed during these operations nor of the stand present when the first commercial thinning was undertaken. There is, however, good information on what has subsequently been cut, the gross returns from stumpage, the volume now present, and growth of the present stand as determined from increment borings.

The tract in 1939 was relatively accessible but needed logging roads. The topography was favorable, and there was a market for second-growth Douglas-fir sawlogs. The problem then was to find a logger who would tackle the job. Fortunately it was possible to locate an operator for this first thinning who was experienced in logging cedar poles in North Idaho. He had no qualms about tackling the job, since the kind of operation used for cutting and skidding cedar poles, in many ways, approximated what was visualized as the requirements for commercial thinning of immature Douglas-fir. At any rate, this contractor successfully carried out the thinning, using a type of logging operation commonly referred to as jammer logging. During the period from the winter of 1939 to November 1940, the entire property was commercially thinned and more than 1 million board feet of sawlogs were removed. In this operation, probably one-third of the cutting was in the upper crown canopy, with the balance being distributed among other classes of trees. Whether one wanted to do so or not, it was necessary to take

THE AUTHORS are associated with the Industrial Forestry Association; the Soil Conservation Service; and the Washington State Department of Natural Resources, respectively. Messrs. Tinney and Quam are in Seattle and Mr. O'Donnell, in Olympia. They appreciate the help of F. H. Eyre, staff editor of *Forest Science*, in preparing the manuscript.

[1]The Bayh property was certified as a West Coast Tree Farm on November 1, 1944, Certificate No. 37, by the Joint Committee on Forest Conservation, predecessor to Industrial Forestry Association.

TABLE 1.—HARVEST VOLUME SUMMARY (1939-1960)

Product	Units	Volume (Converted to M bd. ft.)[1]
Douglas-fir sawlogs	2,197.4 M bd. ft.	2,197.4
Douglas-fir piling	69,230 lin. ft.	576.9
Western redcedar poles	9,775 lin. ft.	65.2
Western redcedar sawlogs	8 M bd. ft.	8.0
Western hemlock sawlogs	131.4 M bd. ft.	131.4
Western hemlock pulpwood	239 cords	99.6
Total		3,078.5

[1]Converting factors: 2.4 cords pulpwood = 1 M bd. ft.; 120 lin. ft. piling = 1 M bd. ft.; 150 lin. ft. poles = 1 M bd. ft.

TABLE 2.—GROSS STUMPAGE RETURN (1939-1960)

Product	Gross stumpage
Douglas-fir sawlogs	$34,296
Douglas-fir piling	13,288
Western redcedar poles	743
Western redcedar sawlogs	105
Western hemlock sawlogs	1,744
Western hemlock pulpwood	691
Total	$50,867

out some of the larger trees in order to make the operation financially feasible.

Between November 1940 and the summer of 1952, there were several minor thinning operations for hemlock pulpwood made at 2-3-year intervals over several portions of the property. Logging was done with a small crawler-type tractor and with horses. These again were contract jobs, as were all subsequent operations. During the summer and fall of 1952, a thinning operation was carried out which removed more than 600 M board feet. Skidding was done with the aid of a crawler-type tractor. The next thinning was done in the summer and fall of 1957 when over 400 M board feet were removed. Products cut were sawlogs, poles and piling. In this operation, there was considerable thinning from below to salvage weak trees and thus to anticipate mortality. It was a horse-logging job. The final thinning recorded here was carried out between January and May 1960, when 250 M board feet were removed. Products produced were primarily poles and piling. Skidding was again by tractor.

In the aggregate a harvest of 33,118 board feet per acre has been cut from the property since 1939 (Table 1), or 1,505 board feet per acre per year, for the 22-year period since thinnings were started. Of considerable significance, however, is the fact that the owner did not thin every year, but did so only when he had a good market. Timing the thinning with market demand is a prime essential.

All of these thinning operations involved recommendations and marking by several public and private professional foresters. There were minor differences in marking individual trees, but a surprising over-all agreement in the kind of trees to remove in the various thinning operations.

Returns

What sort of returns did the owner receive from the various thinnings? That he did not fare badly is illustrated in Table 2, showing that he received more than $50,000 for stumpage since 1939. It should be pointed out that this is gross return which does not allow for interest on the investment, road-building costs, taxes, or administration by the owner. (The owner estimates that roads now in excess of 2 miles have cost about $5,000.) The average gross return for stumpage is $16.52 per M bd. ft. and $24.86 per acre per year. In all cases the logging was contracted. The stumpage figures therefore reflect return after logging costs were paid.

Present Stand

After the removal of over 3 million board feet in thinnings, in what condition is the present stand? Has it been badly decimated by the repeated cuttings, or is there still a substantial stand on the ground? In order to answer these questions, a timber survey was undertaken in August 1960 by Gerald Hoyer, Gene Little, and Roger Harding of the Washington State Department of Natural Resources. Since there was considerable variation in site and stand condition over the property, four separate stands were delineated. Local volume tables constructed for this area by Tinney and Malmberg in 1947[2] were applied to the tally of trees recorded on the survey with the results shown in Table 3. The present stand as of the spring of 1961 is depicted in the cover photo.

It is interesting to note that the volume of the present stand slightly exceeds the total of all timber harvested during the whole period when thinnings were applied. Further, the present volume is concentrated on relatively few trees, which means that the average tree is of good size. Adding the present volume per acre to the volume per acre that has already been harvested gives a total of 70,048 bd. ft. This exceeds by 15,748 bd. ft., or 29 percent, the volume of 54,300 bd. ft. given for total yield in yield tables for fully stocked 80-year-old stands.[3]

[2]Tinney, William A., and Donald B. Malmberg. Tree management and marking rules, second growth Douglas fir. University of Washington, College of Forestry. 33 pp. Illus. 1948.

[3]McArdle, Richard E., and Walter H. Meyer. The yield of Douglas-fir in the Pacific Northwest, U. S. Department of Agriculture Technical Bulletin 201. 74 pp. Illus. 1930. (Revised 1949).

TABLE 3.—VOLUME PRESENT IN AUGUST 1960

Stand no.	Site index	Number trees 12 in. d.b.h. and larger	Acres	Volume in bd. ft. for trees 12 in. d.b.h. and larger: Per acre	Volume in bd. ft. for trees 12 in. d.b.h. and larger: Total stand
1	160	52.5	13	35,837	465,881
2	130	76.8	16	34,856	557,696
3	160	70.5	41	41,158	1,687,478
4	130	79.7	23	31,453	723,419
Totals			93		3,434,474
Average standing volume per acre				(36,930)	

Table 4.—Comparison of Actual Growth with Normal Yield Table Values

Stand no.	Site index	Normal B.A. (sq. ft.)	Actual B.A. (sq. ft.)	Actual B.A. % normal (1956)	Periodic annual increment: Actual (1956-60) B.A. (sq. ft.)	Actual (1956-60) Bd. ft.	Normal (age 70-80) B.A. (sq. ft.)	Normal (age 70-80) Bd. ft.
1	160	224	118	50	3.7 (.031)[1]	712 (5.9)[1]	2.7 (.012)[1]	1200 (2.4)[1]
2	130	160	122	80	2.6 (.021)	838 (7.0)	3.7 (.023)	910 (5.7)
3	160	224	151	64	2.5 (.016)	804 (5.2)	2.7 (.012)	1200 (2.4)
4	130	160	116	67	4.1 (.035)	1336 (11.5)	3.7 (.023)	910 (5.7)

[1]Numerals in parentheses indicate growth for each square foot of basal area present at beginning of period.

Growth in Board Feet

What has been the rate of growth on the property since the thinnings were started in 1939? Some growth, of course, accumulated on trees that were removed at various times during the period, but how much cannot be determined because of lack of records. But growth can be estimated for trees still standing. This was done by means of 114 increment core measurements made in representative diameter classes by personnel of the Department of Natural Resources, and by the authors. These measurements were then applied to local volume tables with the following results:

Period	Ave. periodic annual growth per acre in bd. ft.
1956-1960	929
1951-1960	733
1941-1960	755

These are indeed substantial growth rates considering that they represent only a portion of the original stand. It should be pointed out that these are gross growth rates in the sense that they do not reflect any loss in volume due to mortality, but in these thinned stands mortality was undoubtedly very low. The tabulation, of course, does not include any growth on trees already harvested.

Comparison of Actual and Normal Yield Table Growth

How does the growth of the present stand compare with that given in normal yield tables? An analysis for the four different stands appears in Table 4. The stocking at present varies from 50 to 80 percent, yet the growth compares very favorably with that shown in yield tables for normally stocked stands. These observations confirm the understanding that it is quite unnecessary for a stand to have a full stocking in order to make good growth.[4] This is well illustrated by the annual board-foot increment for each square foot of basal area (Table 4). For "normal" stands the range is 2.4 to 5.7 whereas for the thinned stands it is 5.2 to 11.5. The thinned stands therefore made much more efficient use of growing stock.

Lessons to be Learned

What lessons can be learned from this operation to benefit other owners of immature Douglas-fir stumpage?

Other owners cannot take similar pride in being a pioneer thinner. They can, however, benefit financially as did the owner in this instance. The fallacy of premature cutting is also obvious. The owner has had many opportunities to clearcut, but thus far has not done so. He sees the advantages of a periodic return and above all has a sound grasp of the principles of tree growth. He has been very successful in watching the market so as to take full advantage when prices were favorable. And it is plain that there does not need to be heavy stocking to assure good growth.

What will be done by this particular owner in the future is, of course, somewhat uncertain. The operations thus far have shown that the rotation could be extended at least to 100 years or longer, and with Mr. Bayh's management probably should be. As of now, it is the intention of the owner to continue the thinnings in order to provide a trust for his children. So far as the present condition of the stand is concerned, a continuation of periodic thinnings some years into the future should be entirely feasible.

[4]Worthington, Norman P., and George R. Staebler. Commercial thinning of Douglas-fir in the Pacific Northwest. U. S. Department of Agriculture Technical Bulletin No. 1230. 124 pp. Illus. 1961.

A Case for Establishment of Wilderness Areas by Congressional Legislation[1]

Frank W. Lara

LAST YEAR the National Wildlife Federation summarized the accomplishments of the 86th Congress and ii ted the Multiple Use Forestry Bill (Public Law 86-517) as the most important conservation legislation to be enacted.

During hearings on this bill, it was widely pointed out that the U. S. Forest Service long had practiced the principle of multiple use in the management of resources under its administration. Why, then, did the Forest Service so actively seek enactment of the Multiple Use Bill?

Several factors actually were involved but, basically speaking, the Forest Service sought recognition by the Congress of what heretofore had been administrative policies, rules, or regulations.

In taking this action on the multiple use forestry proposal, the Forest Service recognized these constitutional functions of government so well known to us all: the Legislative Branch enacts laws; the Executive Branch executes or carries out laws enacted by the Legislative Branch; and the Judicial Branch interprets the laws.

The Congress, of the three branches most directly responsive to the will of the people, has the basic responsibility of enacting laws. Therefore, when it permits agencies of the Executive Branch to issue rules and regulations having the effect of law, the Congress in effect is delegating its own authority. It naturally follows that the Congress determines Congressional policy. This, essentially, is why the Forest Service sought Congressional approval of the long-established multiple use policy.

There is a direct analogy to the question under consideration pertaining to the establishment of a National Wilderness Preservation System. It is to the credit of the Forest Service that wilderness, wild, primitive, and canoe areas were established by administrative order, just as were the principles of multiple use. Proponents of the Wilderness bills seek: (1) official recognition of the wilderness principle; and (2) assurance that wilderness areas will not be altered, invaded, or destroyed by administrative order.

My organization, the National Wildlife Federation, strongly supported the Multiple Use Forestry Bill. It also is supporting the Wilderness Bill. There is nothing incompatible with these positions.

During the past five years, the period since the question of Congressional action pertaining to the establishment of wilderness areas was introduced, questions have been posed by its advocates as well as its opponents. In many instances, these questions have shown a serious lack of understanding or miscomprehension of the full significance and meaning of such legislation. Furthermore, while the act of establishing wilderness areas, *per se*, was in the past purely an administrative procedure, the publicity concerning and national significance of wilderness have developed to the point where it can no longer remain solely in the hands of agencies within the Executive Branch of government. Too many interested people with insufficient knowledge of the policies and the place of wilderness in the over-all land management picture have made it necessary for "an official national policy" under which such areas are to be established, developed, and managed. While the general question under discussion is one which should be handled by a political scientist or a student of government, the direct impact of the establishment of a Wilderness Preservation System on natural resource management principles of the entire country is such that it should be considered by all citizens, and in particular by those directly involved in land management.

Some people, of course, relate Congressional concern with preservation interests and on the other hand, user interests with the continuation of the administrative determination of such policies—in other words, *status quo* versus additional protection through Congressional sanction and law. Such a contrast assumes that administrators are more responsive to the user interests than the preservationists, an assumption that could be radically upset by a political change of administration. In any case, whether these are valid contrasts or not, they are not the primary province of this discussion, which assumes that secure wilderness preservation is our national ideal and that the present question is simply—how?

There can be no question as to whether the Congress is concerned with wilderness preservation on federal lands. The Constitution itself says in the last paragraph of Article IV, Section 3: "The Congress shall have Power to dispose of and make all needful Rules and Regulations respecting the Territory or other Property belonging to the United States." If wilderness preservation is a distinctive undertaking, as this very discussion indicates, and if it requires rules and regulations regarding federal territory, then by the Constitution itself Congress is responsible. Wilderness areas established

(Continued on page 736)

THE AUTHOR is a forester on the staff of the National Wildlife Federation, Washington, D. C.

[1]At the direction of the Council of the Society of American Foresters the JOURNAL OF FORESTRY has solicited and here presents two articles on the subject of wilderness legislation—one *pro* and one *con*. (See facing page.) They are published in this issue as background information for the voting membership of the Society which will this month be invited by the Council to express an opinion through a *Referendum on Wilderness* to be conducted by mail ballot.

A Case for Administrative Establishment and Regulation of Wilderness Areas[1]

H. R. Glascock, Jr.

THE WILDERNESS most likely to endure is wilderness carefully selected. This premise argues for administrative establishment and regulation of wilderness areas.

Since wilderness means different things to different people, it is important to define the term as one plans to use it. Wilderness is here defined as those conditions and qualities which obtain on roadless dedications over 5,000 acres, such as wild and wilderness areas in the national forests. In addition, the assumption will be made that there is and will continue to be need for some wilderness areas; that the question at hand is how the *relative need*, present and future, can best be met. One further premise will be held: that eventually nearly every tract of land on earth will have to be managed consciously for conditions it is desirable to maintain.

Under these assumptions one confronts the question of need. The need of the American people for wilderness areas has never been determined in terms of acreage. Even the most ardent enthusiasts of enlarging wilderness dedications have not made clear their ideas as to what acreage would ultimately suffice. They are fond of saying merely that it is better to "save" too much than too little. Such platitudes are not useful to land managers studying lands for highest use. The key questions of *What kind? How much?* and *Where?* cannot be brushed aside.

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The need for wilderness, whether great or little, is relative—relative to people's need for other benefits from the land. Surely no one would argue that man's need for wilderness is greater than his need for food, water, shelter, clothing, and heat. Wilderness reservations which impound lands capable of producing these basic necessities of life are bound to get in the way of a prolific people dependent on limited land for high standards of living. Such reservations will fall into jeopardy the sooner, and perhaps the very concept of wilderness zoning itself will be brought into disfavor. Meantime, they will have brought about the wastage of perishable, renewable resources needed by the nation.

Nonwilderness uses are to a varying extent compatible and promise to be more so as techniques advance. This fact will make them increasingly competitive with incompatible wilderness as a use of land.

It must be concluded that an adequate reservation of wilderness areas is one which the nation can afford while meeting its basic needs.

What then is the best hope of meeting the permanent need for some roadless areas? Of securing an enduring heritage of wilderness as extensive as the nation will allow? Is it not:

1. The careful selection and zoning after thorough inventory of primarily those high-altitude and low-productive lands whose prospective value as wilderness clearly exceeds their prospective value for other uses?

2. The management of each wilderness area to maintain optimum wilderness conditions under varying use loads?

Clearly, enduring wilderness is defensible wilderness, deliberately administered. There can be no permanent wilderness zonings which are set up in a vacuum where comparison with other uses of the land is ruled out or where progressive management is missing.

Those who do not believe wilderness use can survive comparison and competition with other uses of forest land underrate the value land managers and the public have attached to this use. They also overlook the renewable characteristics of wilderness which cause such cutover areas as the Great Smoky Mountains to be acquired for national parks and others to be sought after, such as the Allagash region in Maine.

If an enduring wilderness reservation is a defensible one, how can it best be established and maintained? We must not overlook what 37 years of experience in zoning for wilderness can show us. The U. S. Forest Service, which conceived the wilderness area concept and started such zoning in 1924, had administratively set aside 14.2 million acres of wilderness-type areas by 1939. Despite transfers totaling over 400,000 acres to the National Park Service since then, the national forest acreage so reserved has risen to an all-time high of 14.7 million acres, including what the Forest Service lists as 4.7 million acres of reserved commercial forest land.

These lands are administered to exclude roads, motorized equipment, and timber growing and harvesting. Significant violations of the strict Forest Service regulations governing these lands have yet to be revealed. By assigning eight percent of the national forest estate to roadlessness the Forest Service has thus been most generous to this restricted use.

Long considering wilderness area establishment and maintenance a part of its multiple-use policy, the Forest Service was fortified in this

(Continued on page 737)

(Continued from page 734)

as at present must therefore be established pursuant in one way or another to some act of the Congress.

There is no executive power in this regard which must not arise from some Congressional authorization. Wilderness preservation must be by Congress. The questions are: Has Congress acted clearly enough and how should Congress act?

There is no question, on the other hand, that land administering agencies should, as at present, set up the areas to be preserved as wilderness in keeping with and in consideration of their other land use policies and programs. But they should do this under clearly stated and defined national policies and standards established by Congress and in accordance with those programs and directives authorized by Congress, with the stability and public understanding that those programs can have. With our land management traditions, there are few who wish to see wilderness firmly preserved who will not agree on this. In such a land-use matter as this, Congress should set the policy, authorize the programs, and keep a careful scrutiny over these policies and programs. But, the executive agencies, the land managers on the ground level, should work out the programs, adopt and coordinate them into and with other programs, and develop the particular rules and regulations needed to manage these areas in accordance with the general agency purposes.

If it is to be our national policy to secure for the American people of present and future generations the benefit of an enduring reserve of wilderness, Congress should so determine. If areas are to be set aside and managed for this purpose, for use and enjoyment in such a way as to leave them unimpaired for such similar future use and enjoyment, in our government, Congress is the body which represents the user and the nation and should so determine and declare this purpose. If the wilderness values are to be protected, it is the responsibility of the Congress to say so.

If it is to be a national policy, not to carry out a wilderness program by setting up a new agency or a new separate category, but to do so by devoting areas already in wilderness condition in parks, monuments, refuges, and forests, Congress is the body in our government to make such a basic decision.

If wilderness is to be preserved in parks, refuges, and national forests without interfering with the purposes for which these areas were established, but rather by administering the areas of wilderness for other purposes in a way so as to preserve also the wilderness character, Congress is the body of our government to make such a decision and to state this purpose. Congress is also the body to decide what special provisions or exceptions to the broad wilderness policy should be made.

Yet, Congress can well give—as it has done in so many instances—the responsibility for carrying out particular parts of such a program to the executive agencies through the delegation of authority. The Forest Service should review the particular areas administered within the national forests; the Fish and Wildlife Service can best delineate such areas in refuges, and the Park Service in parks. It is also better for these agencies to conduct the public hearings that should be held in the all-important matter of establishing exact boundaries. As at present, wilderness areas should be established with the on-the-ground knowledge of the land-managing foresters, park experts, and refuge managers, and ultimately by the President. Congress should clearly give these responsibilities to those men who can best carry them out in keeping with the other land-management policies and aspects in the public interest.

With the responsibility for the future of the wilderness system in the hands of Congress, there is established a procedure for the review by the administering agencies and Congress of the wilderness character and value of each area which may be considered for addition to the over-all system. All lands remain under the administration of the agency presently in charge. There is no interference with the basic purposes which the areas are now serving.

What is essential is that there be a uniform policy and consistency in the standards for the establishment and classification of all wilderness areas, not different ones for each separate agency and further different values considered by each secretary, whether he is in a different department or succeeding a man in the same post. Without the system of checks and balances, which is called for in our system of government, one man, or a limited few, could soon upset a smooth-flowing administration. However, in setting up our government this system of checks and balances was provided. It is the Congress which acts on the part of the people and for the people. Should the establishment of a system of limited land areas be at the discretion of a single individual? If this is the case, where are the democratic processes established by our Constitution and providing for the will of the people to be expressed through its duly elected representatives?

Furthermore, with the checks and balances provided by means of Congressional action and the procedures in passing resolutions and legislation, the individual interests of no one man or group can be effectively or forcefully exerted. What, for example, would be the effect on the wilderness system if a man who is an avid supporter of more wilderness areas was appointed to the secretarial post of one of the agencies which manage wilderness areas? On the other hand, what would be the result of a secretary who was completely against the wilderness preservation principles? Neither of these two extremes is good, yet they are both possible and in either case would not be in the best interest of the American people. The wisdom of our legislators, tempered with the voice of the people expressed in our democratic system, can truthfully and honestly act according to the dictates of the people.

Finally, the actions of any land-managing agency can best be carried out with the official and recognized sanction of the Congress. With the Congress giving its official "blessings" on the setting aside of any wilderness area, this area there-

by becomes the responsibility of the Congress, funds for the proper management and protection may be more readily appropriated; more active use and development in accord with the over-all purposes of the area may be realized; and an orderly schedule can be established for the expansion or reduction of the entire system in accord with national goals and needs of both social and economic importance.

So long as we are going to have wilderness areas established and managed, as such, it is far better that they have the official approval and sanction of the people, expressed through the Congress. Our land managers and administrators are not going to eliminate the wilderness system with one fell swoop. This would be inconsistent with the basic principles of land management which call for the use of land areas for the best possible purposes for which they are suited. Must it, therefore, be necessary for the agencies involved to proceed in their management of these areas on a basis of precedence or would it be wiser, more efficient, and more in the interest of the public if these areas were managed and maintained under the over-all supervision and scrutiny of the Congress?

(Continued from page 735)

belief and practice by the Multiple Use Act of 1960 which declares "the establishment and maintenance of areas of wilderness are consistent with the purposes and provisions of this Act." There is no likelihood that even without this authorization the Department of Agriculture would have discontinued its wilderness zoning program.

The policy on wilderness areas as stated in the Forest Service Manual is clear and admirable and relates to needs: "Land-use studies will be made of areas suitable for wilderness purposes, and those lands found predominantly valuable for wilderness use and needed for that purpose will be so classified and managed. . . . When considering the establishment, modification, or elimination of wilderness and wild areas, forest officers will analyze all public values of the land and determine the highest public value. Wilderness and esthetic values will be given full consideration. There is no simple formula for weighing or evaluating wilderness values against commodity values. The final decision must be based upon a careful appraisal of all public values both immediate and potential."

Using these guide-lines, career national forest administrators are now at work surveying and evaluating resources in the 7.9 million acres of old, uninventoried primitive areas. After local public hearings, the areas are administratively reclassified as wilderness or wild areas with indicated boundary adjustments for additions or exclusions. Studies of these areas represent the best and most complete evaluations the taxpayers may ever get. Certainly they are more reliable than the partial studies advocated by some groups.

The National Park Service has interpreted its basic Act of 1916 as primarily a preservation directive. After 45 years 90 percent of the some 22 million-acre national park system is said to qualify under a reasonable definition of wilderness. The Service does not plan to build roads into this vast roadless domain. This lack of accessibility seems to be largely tolerated at present by the huge motoring public, however inconvenienced it may be by overcrowding in national parks. Perhaps this is because the public does not realize some of the parks have not reached their potential either in number of visitors or dispersal of visitor-load without impairing the scenery. But most people will acknowledge that the National Park Service has done well to carry out a directive for both preservation and use.

Thus, as outdoor museums with the park name, national parks have been managed in their natural state without roads except in relatively small portions where public access was deemed preferable. And this very roadlessness has been by administrative determination rather than by law. In the same way, the U. S. Fish and Wildlife Service has administered vast land tracts without roads.

We find therefore that the administrative agencies with flexibility of management have been unusually responsive to the need for wilderness zoning. Surely land-use determination and regulation are prime purposes for which Congress established the federal land management agencies. Congress would not have the time to look into wilderness matters with the thoroughness of public land managers. A strong case can be made for the increasing competence and broadening interests of these public servants.

True, the administrators have it in their power theoretically to wipe out roadless reservations in the same way a game department can theoretically wipe out deer populations. Congress, too, can wipe out wilderness areas. But none of these is a serious possibility. With changing outdoor behavior, unfolding frontiers of space, varying concepts of wilderness and use-loads in wilderness areas, and shifting relative demands for benefits from the land, enacting land-use delineations and regulations into law makes little more sense than designating game seasons by law.

The pending legislation relating to wilderness (S. 174) is a proposal to create a vast national wilderness preservation system of mixed multiple use, park, and wildlife management lands with assignment of a fixed and common use pattern. The Gargantuan system of up to 65 million acres of federal lands almost entirely in the West would take form with the tacit approval of Congress. It could very well attract a wilderness agency to administer it. It would take in the primitive area zonings whose predominantly wilderness parts have yet to be determined, with dubious provision for later exclusion of parts found after study to be more valuable for other uses.

Congressman Ullman of Oregon has said referring to the proposed wilderness system:

"The economic problem of proper land use cannot be solved once and for all. The relative productivity of each acre or area for different combinations of uses changes with the changing times—as the population grows, as technology develops, as we change our tastes or desires. We must have solutions to the problem that can be adapted to changing conditions. Our success in doing so depends largely on our accuracy in anticipating the extent of future changes."

The wilderness system bill would deprive Congress of its already existing powers of positive action on wilderness matters. Congress can now enact an individual wilderness area into law if it sees fit. Many who favor Congress having a more positive voice in this field oppose the negative-Congressional-action features of the current bill. They are apt to favor the separate enactment into law of each wilderness area in the manner so well established and accepted for national parks.

Others who believe in administrative land-use decisions fail to see what changes have been made in the bill which affect the validity of the following characterization of the first wildernsss system bill (S. 1176) by Dr. R. E. McArdle:

". . . It would give a degree of Congressional protection to wilderness use of the national forests not now enjoyed by any other use. It would tend to hamper free and effective application of administrative judgment which now determines, and should continue to determine, the use, or combination of uses, to which a particular national forest area should be devoted. If this Congressional protection is given to wilderness use, it is reasonable to expect that other use groups will subsequently seek Congressional protection for their special interests."

It is to be hoped that the professional forester will not be intimidated by unjust charges that he is not sufficiently concerned about wilderness; that he will realize opposition to a national wilderness system plan is not opposition to wilderness itself.

May the profession have the wisdom and imagination to project the competition for land use into the distant future; to see that wilderness, like any other exclusive use of land, will survive only as it can justify its existence in competition with all the other needs of our growing population; to see that enduring wilderness is defensible wilderness; to see that only through continuing administrative judgment can wilderness zonings be kept defensible—and, in the end, kept at all.

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Past Fire Incidence in Sierra Nevada Forests

Willis W. Wagener

THAT FIRES recurred frequently over past centuries in the virgin forests of California has been generally accepted as an established fact by foresters. From a fire chronology for the mixed conifer forests of central and northern California originally reported by Boyce (*3*) and re-evaluated by Show and Kotok (*20*), the latter authors concluded that extensive fires had occurred at intervals of 3 to 11 years, or at a "general average periodicity of eight years . . . for all areas studied." Similar chronologies were later presented by Kotok (*14, 15*) and have recently been quoted by Biswell (*1*). In Kotok's second paper he refers to a study on the Stanislaus National Forest and states that 221 distinct fires swept the area between 1454 and 1912, or an average of about a fire every 2 years. Biswell refers to this 2-year average in support of his view that fires from lightning and the aborigines were very frequent in the Sierra Nevada.

The general applicability of the frequent-fire concept to the forested regions of California has recently been challenged by Burcham (*6*). He offered evidence from historic and anthropologic sources that fires could not have been as frequent in the state as the above chronologies had indicated. He pointed out that the incense-cedar decay studies by Boyce on which these chronologies had largely been based represented only a few limited areas in two parts of the west slope of the Sierra Nevada. Burcham also noted that Boyce (*2*) had pointed out a difference in frequency of fires in the two districts where the studies were made.

These differences in viewpoint raise a question as to the actual past fire frequence in the Sierra Nevada forests. As a contribution to this question it has seemed worthwhile to re-examine the available fire wound data from past decay studies and to present the results in sufficient detail to permit the reader to form his own judgments concerning them.

Basis for Chronologies

Neither Boyce, Show and Kotok, nor Kotok gives any specific information on the areas from which their conclusions were drawn. Boyce (*3*) states that his was derived from "some two thousand white firs and incense cedars in the mixed conifer forests of central and northern California." This indicates that the source must have been what were known as "dissection studies"[1] by the San Francisco Office of Forest Pathology, which were confined to these two species. Kotok (*14*), in a statement repeated by Biswell (*1*), reports that Boyce's incense-cedar study "extended from the Oregon line, through the Sierras, to the southernmost part of the California pine region."

Actually, although the dissection studies as a group took in areas from near the Oregon line to the central Sierra National Forest, only five of them (Table 1) afforded age counts on fire wounds, and of these only three were in incense-cedar. On the remainder, including an incense-cedar study area at Cow Creek on the Stanislaus National Forest, age counts on wounds were omitted. Moreover,

[1]Studies of cull from decay in incense cedar and white fir carried out under the general direction of the late E. P. Meinecke.

TABLE 1.—STUDY LOCATIONS FOR WHICH COUNTS OF FIRE WOUND AGES ARE AVAILABLE[1]

Location	Year	Tree species	Area	Trees examined		
				Total	Having fire wounds with countable ages	
			Acres	*Number*	*Number*	*Percent*
Sloat (Plumas N.F.)	1915	Incense-cedar	205	510	354	69[2]
Westville[3] (Tahoe N.F.)	1913	White fir	25(?)	56	20	36
Strawberry (Stanislaus N.F.)	1915	Incense-cedar	80	266	130	49
Crockers (Stanislaus N.F.)	1916	Incense-cedar	75	200	95	48
		White fir	11	50	14	28
Ellis Meadow (Sierra N.F.)	1917	White fir	51	276	117	42
Subtotals	———	———	447	1,358	730	53
Madsens (Sierra N.F.)	1921	White fir	38	257	102	40
Pinecrest (Pickering study, Stanislaus N.F.)	1929	Ponderosa pine, sugar pine, white fir, incense-cedar	40	890	499	56
Totals	———	———	525	2,505	1,331	53

[1]The first five locations formed the basis for the Boyce, Show and Kotok, and Kotok fire chronologies.

[2]Differs from percent for trees with fire scars given by Boyce ([*3*], p. 39) because only trees with fire wounds of countable ages are included here.

[3]Fire record incomplete.

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at one of the five—the Westville location—the fire wound record was incomplete in that only the age of the oldest fire wound on a tree was counted, making the record of limited value in establishing a fire history for the area. Including Westville, 730 trees with countable fire wounds out of a total of 1,358 study trees on the five areas were available to Boyce, and subsequently to Show and Kotok, for establishing their fire chronologies.

Counts at two additional locations, Madsens on the Sierra National Forest and Pinecrest on the Stanislaus National Forest, later increased the total number of trees with counted fire wound dates from 730 to 1,331 (Table 1).

All of the study areas were located in mixed coniferous stands at elevations of 4,300 to 5,600 feet on the west slope of the Sierra Nevada Range from the Feather River on the north to the San Joaquin River on the south (Fig. 1). All were well back of the Mother Lode belt, in which the native vegetation was seriously disturbed by cutting and fire following the 1849-1850 Gold Rush. At no location was there anything to suggest that fire histories on them differed from those of the general surrounding districts. In fire history, therefore, they should be representative for much larger areas than the relatively limited acreages of ground actually covered by the studies would suggest.

Fire Record Value of Conifer Species

As pointed out by Lachmund (*16, 18*) and confirmed by Show and Kotok (*20*), the species components of the mixed-conifer forests in California differ in susceptibility to cambial injury by fire. They found that incense-cedar was the most susceptible and white fir the least susceptible of the four species compared. Sugar pine and ponderosa pine were intermediate.

The data in Table 1 bear out these conclusions. At Crockers, 48 percent of the incense-cedars bore countable fire wounds as compared with only 28 percent of the white firs. At both Ellis Meadow and Madsens, where only white firs were cut, the percentages of trees with fire wounds were lower than at Sloat and Strawberry, where only incense-cedar was studied.

The difference is attributable chiefly to differences in bark characteristics. The outer bark in incense-cedar is rather dry and stringy and tends to be deeply furrowed; thinly covered crevices alternate with thick bark ridges which protect the inner bark and cambium from heat injury. Killing of the cambium under the crevices does not require very prolonged or intense heat. Accordingly, narrow wounds from fire are common in the species in locations subject to past fires. Many of these heal over and close within 5 to 10 years. However, Lachmund found that once a fire wound in incense-cedar has been extended by a second fire it is likely to remain open for a long time, and extensions from subsequent fires are more pronounced than in associated species. White fir bark, in comparison, is more corky in texture, much more uniform in depth, and resists fire damage to the cambium much better than incense-cedar bark.

Another advantage of incense-cedar in studying fire history is the character of the principal heartwood decay. The chief heart rot in incense-cedar is a pocket dry rot, with practically sound wood between the pockets (*2*). By following these sound septa it is usually possible to obtain age counts on almost any cross section, even though heavily damaged by pocket dry rot. Thus the ages of few fire wounds in the species are uncountable except where the evidence of older wounds has been burned out.

In white fir, conversely, not only is the heartwood less resistant to

FIG. 1.—Locations of decay studies in which dates of fire wounds were determined from ring counts.

decay than in incense-cedar, but the chief fungi causing basal decay in the species attack the wood quite uniformly, making the annual rings uncountable when the decay has reached an advanced stage.

On open old fire wounds in both species the calluses marking the locations of the oldest wounds often burn out, destroying the record of their occurrence. For this reason the record of old fires in a stand is much more fragmentary than for more recent fires, even though many trees may be still present that were there when the older fires occurred.

Sugar pine is of especial value in ring counting because of its well-maintained diameter growth to an advanced age on good sites and the relative durabilitiy of its heartwood. In the Pinecrest (Pickering) study, the most reliable counts on fire wound ages, particularly for the older past fires on the area, were obtained from this species. Unfortunately, no counts on sugar pine were available from the other locations.

Methods and Accuracy

Counting procedures.—Age counts of fire and other wounds and of trees were ordinarily made on stump tops about 1.5 feet above ground level measured midway on the slope. If wounds were evident closer to the ground but did not extend to stump height, a supplementary saw cut was usually made into the stump in the side where the fire wound or scar was located, and this part of the stump was split off, baring the wound calluses in cross section.

Counts were made radially from the last outside full ring toward the center with the aid of a wide-field hand lens of medium power. Before a count was started, the top of the stump was examined for the most favorable counting radius. Then a radial strip across the stump surface was shaved with a sharp knife blade, chisel, or timber scribe to bring out the rings clearly. In case not all of a chosen radius was favorable for counting, a new radius might be chosen for the rest of the count, a connection from old to the new being established by following a prominent ring from one to the other and resuming the count there. Each tenth ring was marked to permit rechecking in case of interruption or of doubtful sequences.

Accuracy of counts.—Counting was done as carefully as possible but usually by men without previous ring counting experience. At the start they were given on-the-ground instruction in counting by an experienced project leader. Proficiency normally increased as the season progressed. No planned attempt was made to cross-date, by which ring age is confirmed through the identification, from tree to tree, of prominent rings or ring sequences for which accurate years of occurrence have been established. However, as counting progressed on an area the person making the counts naturally became conversant with the dates for certain of the more prominent fire wounds, such as 1890 for the fire of that year on the Pinecrest area, and these dates came to play a role as partial controls for counts.

Since the days of Douglass (*8*), who was the first to demonstrate the value of the method, specialists in tree ring chronologies have been agreed that cross-dating is a necessary step in establishing the accuracy of the dating of rings for individual trees (*9*). Douglass found an average error of 4 percent in Arizona pines when the dates were not verified by cross-dating, even though he was dealing with virtually wound-free trees and the counting was done in a laboratory. Keen states, in connection with a determination of fire history in the pine region of central Oregon,[2] "Accurate dating of fire scars rarely can be done in the field with the naked eye or even with a powerful hand lens, but sections must be examined under a microscope and the ring pattern cross-identified with a well established master pattern."

Keen probably did not mean that an accurate individual count could rarely be obtained under field conditions. Instead he probably meant that only rarely could all fire dates for an area be accurately established from field counts. The statement is not of universal applicability in any case, because the opportunity for accuracy in field counts is influenced by the general growth rate on the area concerned and by the tree species on which the counts are made. Keen was working with ponderosa pine in an area of low site quality not far removed from the desert fringe, where the diameter growth inside bark of many trees averaged under 10 mm. per decade. On better sites and with favorable species the opportunities for accuracy in field counting would be much better.

Sources of error in counts.—Difficulty in obtaining accurate counts may arise from what Keen (*11*) terms "disturbing influences" such as fire and defoliation, or it may arise from sources other than aberrations in ring growth. The chief sources of disturbance in annual growth layers are:

(1) Fire. As reported by Craighead (*7*), fires may seriously affect the normal pattern of ring growth in coniferous forests if they result in a heavy scorching of foliage. However, his conclusions were drawn from a rather extreme case, a very early season (June) fire for the Sierra Nevada of California in 1924, the driest year so far recorded in this century. Under these conditions the impact on growth could be expected to be near maximum. In south central Oregon Keen (*11*) found that the more severe fires had a marked effect on growth rings, whereas others had little or no effect, the difference apparently depending on the proportion of crown lost. He reported that "false rings were extremely rare but missing rings were not uncommon, especially following abrupt stoppages of growth." Later Keen[3] reported that in central Oregon many trees showed a sudden stoppage of diameter growth after a severe fire in 1829, and in many cases several years of missing rings, indicating severe defoliation.

[2] Keen, F. P. The South Ice Cave fire. A study of effects of fire in ponderosa pine forests. Contribution to a cooperating study. Forest Insect Laboratory, Portland, Ore. Blueline. 15 pp. July 30, 1943.

[3] Keen. 1943. *Op. cit.*

It is evident that fires can be a major factor in the disturbance of normal ring development, often making age counts uncertain without careful cross-dating.

(2) Defoliation. In parts of the West, attacks by defoliating insects may reduce growth markedly or eventually result in heavy mortality among conifers (*11, 13*). Fortunately for our purposes, the middle-elevation forests on the west slope of the Sierra Nevada are reasonably free of serious damage by defoliators. No important defoliator is reported for incense-cedar, and no serious attacks have been recorded on ponderosa or sugar pines. Two defoliators, the Douglas-fir tussock moth and the white fir sawfly, have been reported as causing a severe loss of foliage and some mortality in white fir over rather localized areas in recent years (*21, 22*), but the white fir sawfly confines its attacks chiefly to rather dense second growth (*21*). It seems unlikely that either of these insects so disrupted the growth of white firs included in the studies as to contribue to errors in ring counts.

(3) Climate. Where rainy seasons are divided or where precipitation is highly erratic in time of occurrence, double rings may be formed in a single season (*10*). In these areas the cross-dating of rings is useful but does not guarantee accuracy. In California, however, climatic characteristics are such that Glock doubts if more than one growth layer per year will be produced on the west slope of the Sierra—"except perhaps," he adds, "in cases of partial defoliation." Those conversant with the work of coniferous defoliators in the Sierra Nevada will recognize that the qualification appended by Glock is unnecessary. Accordingly, double rings can be dismissed as a source of error in ring counts there.

Minor sources of ring disturbance include lightning, which may sometimes produce ring abnormalities, as has been reported in both incense-cedar and white fir (*4*).

Other sources of possible error lie in the misidentification of causes of wounds and in nonuniformity in allowance for the ring of the season in which the counts are made.

Old fire wounds resulting from several fires are not likely to be mistaken owing to the readily recognizable discoloration and charring of the face of the wound. However, wounds arising as a result of only a single fire usually show no charring of the wood face but develop as a result of the heat killing of the cambium, as Lachmund has described (*16, 17*). Many of these wounds heal over before additional killing occurs from a second fire, but even so their appearance and location identify most of them as fire wounds. Occasionally, however, a lesion may be attributed to fire when it is actually from some other cause. Such wounds will have no relation to the fire incidence in the area and will tend to obscure the fire chronology record if included in fire wound tallies.

Another chance for error arises from the gradual development during the season of the ring for the current year. During the early part of the season there is no difficulty in beginning the count with the first full ring, that of the preceding year, but if the study proceeds into the late summer or early fall there is a chance for confusion, particularly if the field work is interrupted for a time or if there is a change in the personnel making the counts.

On some of the study areas included in the present review, such as the Pickering area at Pinecrest, there would have been practically no opportunity for confusion because all counting was completed within a few weeks and relatively early in the season. Others continued later, but in this re-tally of the field notes no specific indication of changes in the counting base were noted. If present, they should have been manifested by a consistent displacement of fire wound dates over parts of the cutting area.

Review procedure.—In this reappraisal all fire dates were retallied from the original field notes and tree diagrams, thus insuring that all were placed on the same basis. A number of fire wound dates were followed by a question mark, indicating that difficulties were encountered in the ring count, and that although the date shown was the best the field worker could obtain, its accuracy could be questioned. Rather than omit these I chose to tally them according to the possible dates shown. Occasionally wounds were designated as caused by "fire?" indicating that to the note taker the most probable cause seemed to be fire but that he could not be certain of it. These I tallied as fire wounds.

Also, the review turned up some apparent discrepancies in assigned dates, such as differences of a year in the dates assigned to wounds that apparently occurred from the same fire in trees situated in the same general group. I decided to tally these just as shown in the notes, without attempting corrections to make the dates conform to what appeared to be the true ones.

The Fire Record

The tallied results are graphed by individual study areas (Fig. 2). Records from the upper five localities were available to Boyce and to Show and Kotok in establishing their fire chronologies. Those from Madsens and Pinecrest did not become available until later. Because the vertical scale in Figure 2 represents numbers of trees with wounds originating in a given year rather than wounds alone, the figure, when read from left to right also provides some indication of the increasing basis of trees with fire wounds with the progress of time.

From the patterns of distribution by years of the graphed trees with wound age records, a definite peaking of numbers around certain years is evident. Assuming that all dates were determined with equal accuracy, this increase in incidence to a peak year, followed by a progressively lessening incidence, could not be expected from what we know of fire in the forest. It would mean that mild burns, which leave only a few scars but reduce the volume of flammable material on the ground, pave the way for increasingly severe burns up to a peak year after which burns decrease in severity over several succeeding years. Such a progression would violate all experience with fire behavior.

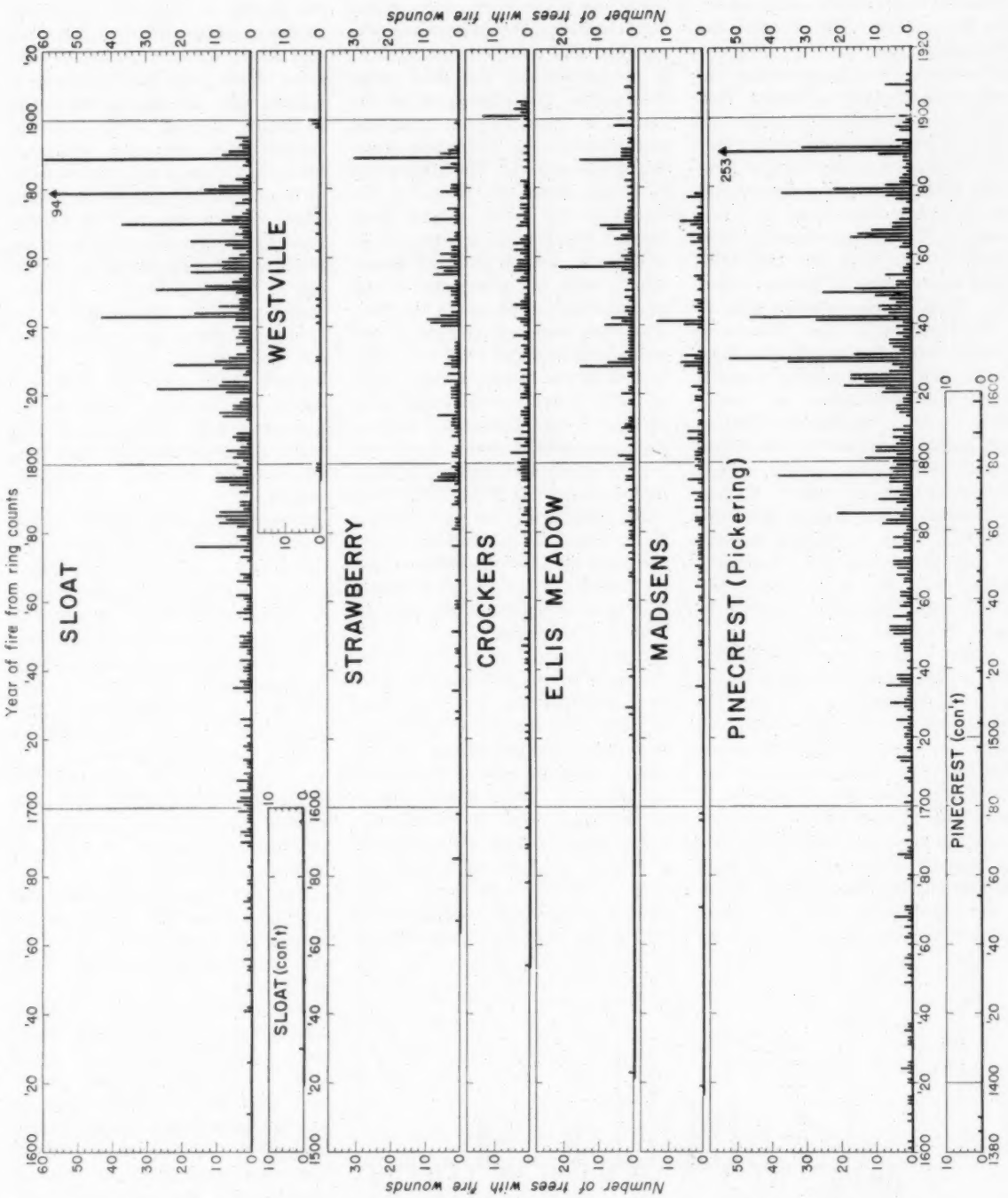

FIG. 2.—Tally by individual study locations of trees with fire wounds of given years of origin as determined by field counts of annual growth rings. The Madsens and Pinecrest records were not available to Boyce or to Show and Kotok in establishing their fire chronologies. As explained in the text, part of the years of origin as determined in the field were inaccurate.

If these patterns of incidence were actual, they should show a relation to weather conditions. Precipitation records are available for Sacramento (Fig. 3) and San Francisco from the 1849-1850 season onward, and temperature records since the early seventies. They offer no consistent support for the form of incidence patterns in Figure 2. For example, on the Pinecrest area, incidence of fire wounds in the graph rises from 1875 to a peak in 1878, then declines to 1884. However, rainfall for the 1877-1878 season was 34 percent above the mean at Sacramento and 60 percent above at San Francisco; spring rains continued into May, there was no prolonged summer heat, and September was cooler than in the preceding and following years. These are not conditions under which one would expect maximum fire intensity. Rather, one would expect it in a year such as 1877, after a seasonal rainfall of only 50 percent of the mean and with temperatures for July, August, and September above the mean for those months.

From still another standpoint, the fire frequency indicated by the individual year records on the graph seems highly improbable. All of the stands in which the decay studies were conducted were uneven-aged, with all age classes represented. If fires had been as frequent as the figure suggests if taken literally, there would have been no opportunity for seedlings to become established and no forest would have been present, let alone an uneven-aged one.

A much more logical explanation is that not all of the age determinations made in the field counts were accurate, for reasons already outlined and as often indicated in a comparison of the field notes themselves. I participated in the counts on three of the areas and can attest to the difficulties sometimes encountered in attempting to obtain accuracy. However, for most of the more recent fires, enough counts were accurate to establish the actual years of occurrence, with the erroneous counts grouped around them. On the Pinecrest area many of the major fire years back through 1796 were confirmed by the counts on tree number 372, a fire-scarred sugar pine which the field man noted as having exceptionally wide, clear, and readily counted growth rings. This tree showed 1890, 1878, 1842, 1830, 1822, 1801, and 1796 as dates for major fires. Although not leaving a record on this particular sugar pine, evidence in Figure 2 indicates that fires occurred on the area in 1849 and 1865 also.

Applying this reasoning to the Pinecrest graph in Figure 2, there were probably not over three fires between 1860 and 1884, two major ones and a possible minor one, although the graph shows fires in all but three of these years. Rings missing as a result of fire damage to the crown reduce the age count and in the graphed results shift the apparent dates to the right. This effect is particularly noticeable following the 1879 and 1889 fires on the Sloat area and the 1890 fire at Pinecrest.

Because counting proceeded from the outside in, and each major fire probably caused heavy foliage kill and strong growth disturbance on some of the trees that survived, it follows that the chances for errors in dating increase as the count is carried back into past centuries, while at the same time the number of trees with fire wounds decreases. These chances are further heightened by the handicaps to counting interposed by discoloration or decay of the wood likely to be associated with old fire wounds. Accordingly, the specific dates shown for old wounds, such as those formed in the 16th and 17th centuries, are to be regarded as approximate only. They indicate that a fire occurred at about that time but not exactly what year it occurred.

Statements accompanying the fire chronologies offered by Boyce (*3*), Show and Kotok (*20*), and Kotok (*14, 15*) suggested that the fires in all of the years listed were general and covered large acreages. However, a check on the locations within a study area of the trees bearing fire wounds of a given year or year group indicates that fires did not always burn over all of a study area. As an example, the 1870 fire at the Sloat location left no wounds on one side of Rattlesnake Creek, although the study extended to both sides of the stream.

For fire years sufficiently well represented in the wound record to provide a reasonable index on this point, six fires at Sloat, four at Strawberry, one at Crockers, five at Ellis Meadow, two at Madsens and one at Pinecrest appeared not to have covered the entire study area, or, if they did so, passed over part of it without creating any fire wounds as a record. Lightning fires starting under conditions not favorable for general spread are particularly likely to be of this type. Other cases of limited spread undoubtedly occurred, but in years represented by too few fire-wounded trees to judge fire extent on the study areas.

The single trees with wounds dated 1903 and 1907 respectively on the Pinecrest area are examples

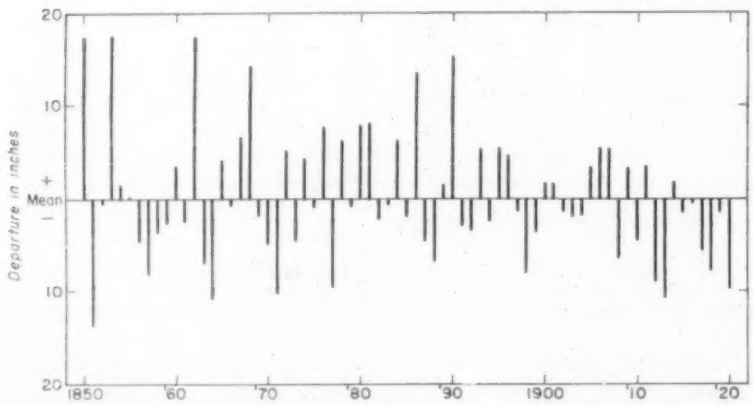

FIG. 3.—Departures in inches from mean seasonal precipitation, July 1 to June 30, at Sacramento, Calif. from 1849-1850 to 1919-1920. Mean = 18.50 inches.

TABLE 2.—FIRE CHRONOLOGIES IN THE SIERRA NEVADA AS LISTED BY BOYCE *(3)* AND SHOW AND KOTOK *(20)* AND PROBABLE FIRE YEARS BY INDIVIDUAL STUDY AREAS FROM FIGURE 2. DATES OF APPARENT MAJOR FIRES ARE ITALICIZED. WESTVILLE HAS BEEN OMITTED BECAUSE OF ITS LIMITED RECORD

Years of severe or extensive fires		Probable fire years by localities (from Fig. 2)					
Boyce	Show & Kotok	Sloat	Strawberry	Pinecrest	Crockers	Ellis Meadow	Madsens
				1588			
				1668			
	1685						
				1686			
	1690	1690					
	1699	1699					
1702	1702	1702					
1708	1708	1708					
				1714			
	1719						
1720							
				1725			
1726	1726	1726					
				1730			
1735	1735	1735		1735			
	1743	1743					
1746							
	1747						
1750	1750	1750					
				1751			
				1755			
1757	1757	1757					
		1762					
	1766	1766					
1767				1767			
				1770			
				1775			
1776		*1776*					
				1778			
				1782			
		1783					
1784							
	1785			*1785*			
1786							
				1789			
							1791
1795		1795	*1795*				1795
	1796			*1796*			
					1798		
				1801			
						1802	
				1803	1803		
1804	1804	1804					
					1807		1807
	1809						1809
						1810	
1814			1814				
	1815	1815		1815			

Years of severe or extensive fires		Probable fire years by localities (from Fig. 2)					
Boyce	Show & Kotok	Sloat	Strawberry	Pinecrest	Crockers	Ellis Meadow	Madsens
				1820		1820	
1822	1822	*1822*		1822			
			1824	1824			
						1828	
1829	1829		1829				1829
				1830			
							1831
				1834			
1837	1837				1837		
		1840				*1840*	
							1841
1842			*1842*	*1842*	1842	1842	
	1843	*1843*					
				1845			
					1846		
				1849			
1851	1851	*1851*	1851				
					1853		
				1854			
			1855				
1856	1856	1856			1856		
			1857			*1857*	
		1858					
			1859				
			1861				
					1862		
					1864		
1865	1865	1865	1865	1865		1865	
							1866
					1869	*1869*	
		1870					1870
1871			1871				
					1872		
							1877
				1878			
1879	1879	*1879*	1879				
1886			1886				
						1888	
1889	1889	*1889*	*1889*				
				1890			
		1895					
				1897			
						1898	
1899							
					1901		
					1903		
				1909			

in which wounds have been attributed to fire but were probably from other causes. Scattered cases of this must occur elsewhere in the graphed record for all areas. Adjacent to common routes of travel, wounds could have been from actual fires but not wildfires, for detailed accounts of early travelers through the Sierra Nevada, such as those of Bruff (*5*), show that overnight campfires were often built against or near the bases of trees flattened by old fire wounds. Local cambium injury from the heat of these fires could have resulted even though the fires did not escape. However, part of the areas, including the one near Pinecrest, were not on established routes of travel, and this type of individual wounding is not to be expected on them. Practically all of the older dates, such as those before 1760, are thought to represent actual wildfires.

Fire incidence.—Differences in views on earlier fire history in Sierra Nevada forests center chiefly around two points, (1), the frequency with which fires occurred, and (2) their origins. This review can contribute little to the second point, but it should provide more specific evidence on the first than has been available in published accounts to date.

In Table 2 the most probable fire dates on the different study areas are listed, as judged from the graphed data in Figure 2. Dates of what appear to have been major fires are italicized. For comparison the Boyce and the Show and Kotok chronologies are also given.

Even though included as probable, some of the dates listed are open to considerable question. For example, the four fires in the Strawberry list between 1855 and 1861 may not all have been separate fires, although they came at a time when white men were frequenting the mountains on exploratory trips and fires could well have resulted as often as every other year.

It will be noted that both the Boyce and the Show and Kotok chronologies depend heavily on the Sloat and Strawberry records, although neither includes the fire of 1870 on the Sloat area. Comparing the records for the six separate locations and assuming that the dates chosen are the correct ones for the fires that they represent, 19 cases are found in which fires occurred on two areas in the same year, one case (1795) of fires on three areas, and two (1842 and 1865) when four areas were burned over in a single year. The remaining 69 occurrences listed were confined to a single one of the six locations.

Table 2 does not include fires, particularly in the earlier years of record, which produced wounds for which the actual year of occurrence is questionable. To cover these as well as the fires listed in Table 2, I tallied, by inspection from the graphs in Figure 2, all fires that I considered to be probable after a chosen date when fire wound representation seemed to be reasonably complete. The results (Table 3), showing average intervals between fires of 7 to 9 years for the various localities, are open to question because of the interpretative judgment involved. If anything, the tallies are thought to be on the generous side, that is, actual fire incidence may have been a little less frequent. Moreover, the tallies do not take into account the indications that not all fires burned over an entire study area. Allowing for these considerations, the average intervals between fires for individual trees were probably as long as 8 or 10 years.

For the Pinecrest area (Pickering study plots) much shorter average intervals of from 1.1 years[4] to 2 years (*15*) between burnings have been reported. These reports trace to a preliminary chart which I prepared in the late 1930's to accompany a talk before a local gathering of foresters on fire history on the Pickering plots. The chart was similar to that prepared from the same original field notes for Figure 2 of the present paper, where it is designated as the Pinecrest area. The original talk pointed out that not all age counts of fire wounds undertaken in the field could be made with equal accuracy and that because of this difficulty only the more obvious peaks in numbers on the chart represented actual fires. In later interpretations of the chart by others, this explanation was overlooked and each date shown was accepted at full face value, with resulting regrettable misunderstandings of the probable past fire incidence on the plots.

For foresters and ecologists the ranges in length of periods between damaging fires are likely to be of greater interest than the average fire periodicity in interpreting the character of the resulting forests.

On the Sloat and Pinecrest areas, where the basis in fire-wounded trees is greater than at the other locations, tallies of probable intervals between damaging fires back to 1815 at Sloat and to 1785 at Pinecrest show minimum intervals of 2 years at both locations. The maximum interval was 14 years at Sloat and 21 years at Pinecrest. These are long enough to permit seedlings to become established and to develop some degree of fire resistance before the next general fire on the area.

TABLE 3.—FIRE FREQUENCY BY LOCALITIES AS JUDGED FROM GRAPHS OF OCCURRENCE (FIG. 2) BASED ON FIRE WOUND AGE COUNTS

Locality[1]	Tally of probable fires				Average interval between fires
	Starting year	Closing year	Span	Total fires	
			Years		*Years*
Sloat	1640	1910	270	38	7
Strawberry	1720	1910	190	25	8
Pinecrest	1540	1910	370	51	7
Crockers	1680	1910	230	29	8
Ellis Meadow	1760	1910	150	20	7
Madsens	1730	1910	180	21	9

[1]Westville omitted because of inadequate record.

Other Western Fire Chronologies

In the pine region of south central Oregon, Keen (*11*) found

[4]Reynolds, R. D. Effect of natural fires and aboriginal burning upon the forests of the central Sierra Nevada. M. A. thesis. Univ. of Calif. Dept. of Geography. 262 pp. Illus. 1959.

that, on the Watkins Butte sample area northeast of Fort Rock, fires during the 19th century had swept through in 1824, 1838, 1843, 1863, 1883, and 1888. He found similar frequencies in earlier centuries. The fires in 1863 and 1883 were evidently not severe and had no noticeable effect on ring growth. Keen (*12*) also reported that a ponderosa pine in Klamath County, Oregon, showed 25 fires at approximately 18-year intervals from 1481 to 1936, when the tree was cut.

Near the South Ice Cave in the same general part of Oregon, fires were found to have occurred in 1829, 1845, 1855, 1869, 1883, and 1905, with a following major fire in 1915. Of these, judging by the ring response, only the 1829 and 1915 fires were very severe.[5]

In these instances the years of fire occurrence were accurately determined by means of the cross-dating technique. They show longer intervals between fires than at the Sierra Nevada locations but this is to be anticipated because of the climatic and site differences between the two regions. The Oregon stands were on relatively marginal sites, with a sparse ground cover, low average annual precipitation, but with a less pronounced dry season than in the Sierra Nevada.

In the ponderosa pine forests of eastern Washington an interval comparable to that in the Sierra Nevada was found by Harold Weaver, Bureau of Indian Affairs, on the Colville Indian Reservation. Fire wounds on a ponderosa pine there indicated an average interval between fires of 7.2 years from 1739 to 1905. The longest period without a wound was 13 years (*19*).

Discussion and Conclusions

History, whether of populations of humans or of trees, is significant chiefly for the understanding that it may provide of the conditions and environments under which those populations existed over a past span of time and for the wisdom that this understanding may yield in the guidance of future actions or policies. Forest fire history presents a number of intriguing aspects, such as the origins of fires, their character and intensities, the relation to weather, and the ecological influence of fire on the forest. However, the present reappraisal from decay-study records has been confined to the question of fire frequency for the periods covered within the study areas and the subsidiary one of whether the frequency pattern underwent any marked change after the coming in large numbers of the white man to California at the time of the Gold Rush.

Some of the statements made in connection with earlier chronologies were undoubtedly too broad and inclusive, but the evidence indicates that the conclusion by Show and Kotok (*20*) of a general average fire periodicity of 8 years at all areas studied was substantially correct and needs only minor adjustment to bring it into line with the probabilities of an average 8 to 10 year incidence, as developed here. For the Pinecrest area this frequence holds to before the middle of the 16th century; for two other areas back to the 17th. Intervals between fires on these areas were as short as 2 years or as long as 21 years.

On the subsidiary question of change in frequency pattern after the coming of the white man, an inspection of the graphs in Figure 2 suggests that no major change occurred until after 1900, corresponding roughly with the establishment of the national forests. On one or two areas, such as at Strawberry, the rate of incidence appears to have increased temporarily about 1855, but only for a few years. The average periodicity of 8 to 10 years between fires of any consequence corresponds fairly well with the 7.2 year average interval cited for the Colville Indian Reservation in Washington. From the fact that there was no marked change in incidence pattern with the advent of the white man, one may infer that most fires in the middle elevation stands represented by the study areas were from natural sources, such as lightning. None of the locations appear to offer a parallel to special situations, such as that in Yosemite Valley, where the evidence for control of the vegetation by fire on the part of the Indians seems strong,[6] whether for protection from ambush or to favor the oaks, the acorns of which constituted an important food staple for the natives. Fires there may have occurred at more frequent intervals than the 8 to 10 year average for middle elevations in the Sierra Nevada as a whole, as developed from the study records reported here.

[5]Keen. 1943. *Op. cit.*

[6]Reynolds. 1959. *Op. cit.*

Literature Cited

1. BISWELL, H. H. 1959. Man and fire in ponderosa pine in the Sierra Nevada of California. Sierra Club Bul. 44: 44-53.
2. BOYCE, J. S. 1920. The dry rot of incense cedar. U. S. Dept. Agric. Bul. 871. 58 pp. Illus.
3. ————. 1921. Firescars and decay. The Timberman 22(6): 37.
4. ————. 1923. Decays and discolorations in airplane woods. U. S. Dept. Agric. Bul. 1128. 43 pp.
5. BRUFF, J. G. 1949. Gold rush; the journals, drawings and other papers of J. Goldsborough Bruff, Captain, Washington City and California Mining Association, Apr. 2, 1849—July 20, 1851. Ed. by Georgia Willis Read and Ruth Gaines. California Centennial Ed. 794 pp. Columbia Univ. Press., New York.
6. BURCHAM, L. T. 1959. Planned burning as a management practice for California wild lands. Calif. Dept. Natural Res. Div. of Forestry. 21 pp. (Processed.)
7. CRAIGHEAD, F. C. 1927. Abnormalities in annual rings resulting from fires. Jour. Forestry 25:840-842. Illus.
8. DOUGLASS, A. E. 1919. Climatic cycles and tree growth. Carnegie Inst. Wash. Publ. 289. Washington, D. C. Vol. 1. 127 pp. Illus.
9. GLOCK, W. S. 1937. Principles and methods of tree-ring analysis. Carnegie Inst. Wash. Publ. 486. Washington, D. C. 100 pp. Illus.
10. ————. 1941. Growth rings and climate. Bot. Rev. 7:649-713.
11. KEEN, F. P. 1937. Climatic cycles in eastern Oregon as indicated by tree rings. Mo. Weather Rev. 65: 175-188. Illus.
12. ————. 1940. Longevity of ponderosa pine. Jour. Forestry 38:597-598.
13. ————. 1952. Insect enemies of western forests. U. S. Dept. Agric. Misc. Pub. 273. Rev. ed. 280 pp. Illus.
14. KOTOK, E. I. 1930. Fire, a problem in American forestry. Sci. Monthly 31:450-452.
15. ————. 1934. Fire, a major ecological factor in the pine region of California. Fifth Pac. Sci. Congr., Victoria and Vancouver. Proc. (1933). pp. 4017-4022.
16. LACHMUND, H. G. 1921. Some

phases in the formation of fire scars. Jour. Forestry 19:638-640.
17. ————. 1923a. Bole injury in forest fires. Jour. Forestry 21:723-731. Illus.
18. ————. 1923b. Relative susceptibility of incense cedar and yellow pine to bole injury in forest fires. Jour. Forestry 21:815-817. Illus.
19. LEBARRON, RUSSELL K. 1957. Silvicultural possibilities of fire in northeastern Washington. Jour. Forestry 55:627-630.
20. SHOW, S. B., and KOTOK, E. I. 1924. The role of fire in the California pine forests. U. S. Dept. Agric. Bul. 1294. 80 pp. Illus.
21. STRUBLE, G. R. 1957. Biology and control of the white-fir sawfly. Forest Sci. 3:306-313. Illus.
22. WICKMAN, B. E. 1958. Mortality of white fir following defoliation by the Douglas-fir tussock moth in California, 1957. U. S. Forest Serv. California Forest and Range Expt. Sta. Res. Note 137. 4 pp. Illus.

Opportunities in Forest Products Marketing in the Far West[1]

Richard W. Bruce

THE FOCAL POINT of much rather controversial interest was Senate Bill 840, first introduced in the Senate on January 25, 1957, by Senator Humphrey. This bill called for the Secretary of Agriculture to ". . . provide farmers and other owners of small forest properties with current information on markets and prices . . ." (*4*). The result was a small avalanche of material both pro and con, from which the following observations might be made:

1. Lumber price reporting is already adequate.
2. Reliable stumpage price reporting may not be possible.
3. There appears to be little discussion concerning price reporting for sawlogs.
4. Local rather than federal aid should do the job of price reporting if it is to be done for forest products.
5. Some feel price reporting may lead to federal controls and unfavorable tax adjustments.
6. Price reporting may be desirable in spite of the possible implications and limitations.

The controversy raises questions concerning both desirability and feasibility of market reporting.

Findings in Washington State indicate that *sawlog* price reporting, at least, is desired by both forest landowners and operators in the forest industry (*1*). This paper, then, will deal with sawlog market reporting; specifically, sawlogs from private forests. An assumption will be made that such reporting is desirable in order that we may proceed to discuss the actual job of collecting and disseminating market information. Feasibility will be examined in conjunction with problems encountered.

Programs in the Far West

Numerous local market reports are being compiled by county agents and farm foresters. Many cooperative state and federal agencies are also doing some rather extensive market reporting. The purpose has always been to inform private landowners of market conditions and prices, often with the secondary aim of encouraging forest management. Regularly published reports are now available in Oregon, Washington, Idaho, Montana, and California. These reports vary in extent of geographic coverage and frequency and they all tend to emphasize prices for sawlogs and pulpwood, as well as minor forest products. The limited information available indicates that these reports have been very favorably received. Acceptance and encouragement has come from landowners, loggers, and sawmill operators.

With that brief background, and armed with four years of monthly data from Washington State, I will explore the following questions:

1. What information has been gained from these reports?
2. What problems have been encountered?
3. Where do the opportunities lie for future development?

Information Gained From Market Reporting Experience

Method of collecting data.—Two common methods of obtaining price and market information are mail questionnaires and personal contact. Our experience indicates that the decision to use one or the other, or a combination, is closely related to the extent of market development in the area. If an open market exists in which there are numerous buyers and sellers with frequent sales being transacted, it is likely that a fairly uniform market price will prevail throughout the area. But if there are only a few buyers and sellers with infrequent sales, prices may be quite varied from mill to mill or town to town.

We have good examples of both of these situations in Washington. Eastern Washington has a well established open market for private sawlogs. Central Washington has

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[1]Scientific paper 2064, Washington Agric. Expt. Sta. Work was conducted under project 1481.

only a few private landowners selling to a relatively large number of mills that depend mainly on timber from either their own land or public land.

In eastern Washington we have used a mail questionnaire. This questionnaire is sent each month to mills that purchase sawlogs delivered at the mill. An evaluation of the results of this experience has led us to make two observations: responses have been received in sufficient number to adequately define the market price within the limitations imposed by product standards and scaling practices; and the responses have been sufficiently free of bias to be reliable. Over 70 percent of the region's mills cooperate to some extent; about 25 percent of them respond more than half the time. The usual response each month has been from 20-25 percent of the region's mills. We have found that such a response is adequate if it is sufficiently representative of the various mill types and sizes.

The conclusion concerning freedom from bias was drawn after analyzing in detail the records of a group of randomly selected sawmills in eastern Washington showing the prices they paid for sawlogs from private land. It would seem justifiable, then, to depend on a mail questionnaire in an area with a well established open market.

On the other hand, a less developed market poses a different problem. With mail questionnaires, the replies will not be comprised of the same mills each time. Hence, if large price differences occur between mills, or between localities, estimates based on mail questionnaires may show wide variation from month to month. Such variation may be thought to be due to changing market conditions when in reality it might be due to sampling differences.

Experience in central Washington has led us to depend more on contacts by field personnel than mail questionnaires for this type of market. Such personal contact permits use of a more carefully selected sample made up of the same mills each time.

Cost of reporting.—In Washington, machine handling is used for every major operation associated with publishing the market report. Such things as addressing and stuffing envelopes, printing, and stapling are all done by machines. The cost of gathering the data, printing, mailing, secretarial assistance and supervision, has been about $80 a month. This means the present cost is five cents per copy for 1,600 copies each month. Initial cost of getting the report organized was, of course, considerably greater.

Value of the report.—A study conducted early this year attempted to learn whether or not the market report was acceptable to forest landowners, and also to describe the impact it was making on the forest economy (*1*). The following is a quotation from that study: "Initial evidence indicates that market reporting may be partly desirable and partly undesirable. Desirable aspects seem to be: it encourages forest management to provide for future growth; it provides information wanted by small forest landowners; and it provides information to a segment of the economy that has frequently lacked such information. It may be undesirable, however, to the extent that continual reminder of present values encourages immediate harvesting without regard for future yields."

In addition to the possible relationship to forest management, we have begun to learn something about the economic environment in which forest landowners operate. One question we have frequently attempted to answer concerns the extent to which forest landowners can influence the price they receive. Does the price they receive depend on certain characteristics which they can control, or do the price-making forces exist outside their sphere of influence? Two bits of evidence available from the market report give support to a tentative conclusion.

Data show that sawlog prices do not have distinct seasonal movements (See Appendix A). This leads us to believe that sawlog price movements are not influenced to a great extent by logging conditions and volume of logs available for sale. On the other hand, we do note a close relationship between sawlog prices and lumber prices. The tentative conclusion we might draw from these two observations is that market conditions for lumber exert a major influence on log prices to which supply conditions adjust.

Such a conclusion is also supported by other research findings. An Idaho study concluded that price-making forces are not within the sphere of influence maintained by the small woodland owner. "Therefore, areas outside of these must be investigated if the forces which determine prices received by small non-industrial woodland owners are to be discovered and evaluated" (*2*).

One major role of agricultural and forest economists is to contribute to an understanding of the market environment. When landowners understand the environment in which they operate, they are in a much better position to adapt to changing conditions. In our economy, price has an important function both in allocating productive resources and in distributing the product in accordance with consumer needs. If price data are inadequate, understanding of the market environment will be inadequate.

Another factor contributing to our understanding is the nature of the geographic price surface. Landowners may wonder why different mills pay different prices for the same commodity. So far, we cannot explain *why*, but we can describe *how* prices vary within some areas. We found, for example, a relatively consistent relationship between distance to a market center and the price paid for sawlogs. Market centers seem to be cities which have a concentration of remanufacturing facilities. Spokane, Washington, appears to be such a center. An analysis of price data shows that the price paid for sawlogs decreases at an average rate of six cents per mile as distance increases out to about 60 miles; this rate of decrease actually varied from five to seven cents (See Appendix B). Beyond 60 miles, we enter another market area which manifests a similar

phenomenon.

We have also been able to determine the price relationship between various species and grades, and to note whether or not such relationships are consistent over time.

Although we are talking here about sawlog prices, once the market value of sawlogs is known, it is fairly easy to estimate logging costs and deduct them from the sawlog price to obtain an estimate of stumpage value. Market information, then, also gives us some insight into the somewhat vague real-value of stumpage.

Each of these pieces of information, available for analysis since market data has been collected regularly, contributes to understanding and provides a basis for more adequate adjustment to our modern, rapidly changing economy.

Extent of industry support.—Another important aspect is the extent of industry support of market reporting. We have received numerous favorable comments from sawmills, landowners, loggers, and others associated with the forest industry. Probably the most concrete evidence, however, was the request from two forestry trade journals to publish the market report information regularly. These are *The Timberman* and *Western Equipment and Timber News.* Newspapers also have felt this type of information to be newsworthy.

Problems Encountered in Market Reporting

The following problems have been faced in attempting to publish a periodic market report.

1. Obtaining an adequate sample at a minimal cost. What is the minimum number of a region's mills that must be contacted in order to assure an accurate estimate of the market price?

2. Obtaining accurate prices within the limitations of existing product standardization and scaling practices. Probably the most significant problems in market reporting today are associated with inadequacies of product definition. The methods used for measuring the quantity of delivered material, too, are an important source of price variation—yet to date the effect of certain scaling practices is undefinable in specific terms.

3. Reporting a meaningful price. Prices *offered* are subject to variation due to bargaining and scaling practices. Prices *paid,* however, do not specify the basis for agreement between buyer and seller if certain factors not related to product quality are considered in the transaction. Which is the most meaningful? Which can be most readily obtained?

4. Defining the number of reports necessary each year. Sawlog prices seldom change very much from month to month; hence, why not publish such prices less often than once a month? One reason is the attention and reminder value of frequent reports received by the forest landowner. These two aspects must be weighed before letting cost of publishing be the main consideration. Cost might be an important consideration, of course, since administrative decision is probably the key determinant as to whether most costs will be fixed or variable. If most costs are variable, the cost of each report published adds as much as the preceding one. If most costs are fixed, however, monthly or weekly reports may not cost much more than quarterly ones.

It cannot be said that these problems have been "solved," if that would imply we have the best possible answer. These are areas deserving of additional attention, and perhaps it is here where the greatest opportunities lie.

Opportunities for Future Development

The final question we will raise is, "Where do the opportunities lie for future development of market reports?"

Minimizing collection cost.—As previously indicated, we have been able to define the relationship existing between various sawlog commodities. For eastern Washington, these commodities are long logs, short logs, stud logs, and pulp logs. Once a fairly consistent relationship is established, it might be feasible to collect prices for a selected commodity only, such as short logs, which represent over half of the material usually purchased by mills in that area. The prices for long logs, stud logs, and pulp logs could then be estimated. The same might also be said of using a selected species.

Also established has been the relationship between sawlog prices and distance to a market center. Another possibility, then, might be to collect prices from market centers or selected localities only, then estimate the price for other locations.

The possibility of minimizing costs will in the final analysis be tempered by two other considerations: first, the ratio of fixed to variable costs as has already been discussed; and second, the needs of the people being served by the market reports. Findings in Washington indicate a desire on the part of private forest landowners for ". . . complete coverage of all the multitude of small forest commodities, both major and minor; and localized geographic coverage" (*1*).

The opportunity remains, however, to devise a means of adequate reporting at a minimum cost. "Adequate reporting," of course, provides us with a second opportunity.

Increasing accuracy.—Reporting selected commodities, species, or locations may also increase the accuracy of reporting for any given cost level by permitting more intensive methods of obtaining data to report. For example, one city could be completely canvassed for each report; hence, we could aim for nearly 100 percent coverage of such a city to insure greater accuracy.

Increased personal contact may be a means of obtaining more reliable information, or use of the telephone, rather than a mail questionnaire.

One of the more noteworthy recommendations for increasing the accuracy of price reporting has been made by Guttenberg (*3*). He suggested that price reporting should recognize five distinct "price populations":

1. Timber being grown for use in the owner's plant.
2. Long term contractual agreements between growers and

users.
3. Public timber.
4. Private sales by informed sellers.
5. Private sales by uninformed sellers.

Obviously, it may be difficult or impossible to obtain information so clearly differentiated; but such a classification recognizes that similar material from different sources may be a different commodity at a different price. Any device used to make price reporting more specific should increase the accuracy.

Coordination.—In Washington, the Washington State University Department of Forestry has published market reports for eastern and central portions of the state. County agents and farm foresters have provided similar information for various counties and areas in western parts of the state. Not long ago, the people doing this work asked the Washington Crop Reporting Service to coordinate their efforts. As a result, the Crop Reporting Service now publishes a statewide forest products market report each quarter. Prices quoted are average prices for market areas made up of several counties each.

We believe this statewide report does not replace the need for local information, but it does do an extremely important job of coordinating a large number of previously uncoordinated efforts. This information provides a basis for understanding price movements over the entire state. Extensive support for this project has encouraged its continuation.

Product standardization. — Obviously, the lack of accurate definition of many forest products makes reliable market reporting difficult. Progress in market reporting will continue to be hampered until more precise grades and standards are developed, and accepted by the forest industry, for sawlogs and other products.

Examination of implications.—Finally, an opportunity lies before us to examine more closely the implications of price reporting in relation to possible government restrictions and taxation programs. Most of the discussions to date have been based on opinions rather than facts. It is the responsibility of agricultural and forest economists to point out the implications of various alternatives before condemning policymakers for acting without being adequately informed.

Summary

The subject of market reporting for forest products has frequently been very controversial. Too often the controversial nature of the subject has prevented an evaluation of actual programs.

Many think that price reporting is desirable; others do not. With some, the main question is not one of its desirability but one of decision as to who should do the job. This paper has attempted to bypass the question of desirability in order to examine a specific program of price and market reporting for sawlogs that has been

Appendix A

Test for Seasonality of Log Price Movements

Analysis of variance of the price of Douglas-fir short sawlogs from private lands in eastern Washington, 1956-1960.

	Sums of squared deviations	Deg. freedom	Variance	Variance ratio, F	99% value F
Among years	112.19	3	37.4	29.4	4.44
Among months	4.60	11	0.4	0.3	2.84
Discrepance	41.97	33	1.27		
Total	158.76	47			

Conclusions: 1. The differences among years was significant.
2. The differences among months was not significant.

Since the primary object was to test the seasonal variation, the second conclusion is the more important. Although there does seem to be a tendency for sawlog prices to be low in February and high in August, such differences are not statistically significant over the relatively short 4-year time period observed.

A seasonal price index computed using the Link-Relative Method[1] shows the following index prices, by month, with the effect of cyclical variation, linear trend, and nonlinear trend removed.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
100	98	99	99	101	101	101	102	98	100	100	99

Observation of this index shows that seasonal price variations from month to month have not been great. For example, if the price level is $30 per thousand board feet in January, the price would be expected to vary only from $29.40 to $30.60 during the following year due to seasonal variation alone.

[1]As suggested by Pearson and Bennett. Statistical methods. John Wiley & Sons, New York. Pp. 95-97. 1942.

Appendix B

Price-Distance Regressions, Spokane Market Area

Time period[1]	Sample size	Least squares equations[2]	R^2
Jan. 57 - May 58	114	$Y = 34.12 - .07028X_1 - .24988X_2$ (.00540) (.02210)	.73
Sept. 58 - Mar. 60	141	$Y = 22.67 - .05100X_1 + .33196X_2$ (.00627) (.02318)	.67
Jan. 57 - Sept. 60	315	$Y = 30.53 - .06345X_1 + .08319X_2$ (.00591) (.00962)	.38

[1]The time periods were selected as follows: Jan. 57-May 58 was a period of decreasing sawlog prices, while Sept. 58-Mar. 60 was a period of increasing sawlog prices. Jan. 57-Sept. 60 was the entire period observed.

[2]Y is the price of Douglas-fir short logs in dollars per thousand board feet, X_1 is the distance from the market center (Spokane) in miles, and X_2 is months. Each month was assigned a number, with January 1957 being month 1, and September 1960 being month 45. The coefficient for X_1 (distance) then shows the amount of variance which occurs in Y (price) for every unit change in X_1 (distance), with the effect of X_2 (time expressed in months) held constant. The standard error of the regression coefficients are given in parentheses under each coefficient.

For the period Jan. 1957-May 1958, sawlog prices decreased at a rate of $.07 for each mile increase in distance from the market center. For the period Sept. 58-Mar. 60, the decrease in sawlog prices was $.05 per mile; and for the entire period, from Jan. 1957-Sept. 1960, the decrease was $.06 per mile.

underway in Washington since 1956.

Actual market reporting experience has provided insight into methods of collecting price data, cost of reporting, value of such reports, and extent of industry support. Problems encountered are related chiefly to reporting accurate information at minimal cost. Opportunities for future development of market reporting in the forest industry lie chiefly in the area of solving these problems as well as examining the implications of such reporting.

Some aspects which experience has shed new light on include relation of market development to methods of obtaining market information, implications of fixed cost-variable cost ratio, extent of bias by reporting sawmills, extent to which available data permit an understanding of price-making forces, seasonality of sawlog price movements, and aspects relating to the geographic price surface for sawlogs.

Literature Cited

1. BRUCE, R. W. 1960. An evaluation of market reporting with possible implications for forest management. Northwest Science Vol. 32, No. 2. pp. 69-75.
2. FRAZIER, G. D. 1960. Small nonindustrial forest owners in northern Idaho. Idaho Agric. Expt. Sta. Bul. 317.
3. GUTTENBERG, S. 1956. Stumpage price reports as a stimulus to timber growing. Proc. Soc. Amer. Foresters Meeting pp. 132-133.
4. U. S. CONGRESS. SENATE. 1957. A bill providing for price reporting and research with respect to forest products. 85th Cong., 1st Session. Senate Bill 840.

Allegheny Section Holds Summer Field Meeting

With an attendance of 150 members, ladies, and guests, the summer meeting of the Allegheny Section was held in Adams and Franklin Counties, Pennsylvania, with housing at Gettysburg College. The dates were August 24-25.

By chartered buses the participants toured the Glatfelter Tree Farm of 1,700 acres, under intensive management.

Visits were made to the Old Forge area of the Michaux State Forest and to the Mont Alto State Forest Nursery. Following a box lunch at Caledonia State Forest Park, the party went on to the plantations of the Hanover municipal watershed.

The tour terminated with a smorgasbord at Glateo Lodge, near Spring Grove.

Chairman George R. Moorehead, in behalf of the Section, thanked the P. H. Glatfelter Company and the Glatfelter Pulpwood Company for their hospitality.

Arrangements for the meeting were efficiently handled by a committee consisting of Harold W. Geiger, chairman; and Tunis J. Lyon, and William Vanidestine.

U.S.S.R. International Timber Trade

Ivan M. Elchibegoff

ONCE AGAIN Soviet timber exports are on the rise and once again an absorbing picture of their significance emerges in the light of U.S.S.R.'s tremendous timber reserves. Generally, it has been known to foresters and related industry groups abroad that the U.S.S.R. contains within its boundaries the largest block of the remaining virgin coniferous timber reserves of the world, estimated by the Russians themselves at more than 50 percent of the world total and 66 percent of the stands in the Northern Hemisphere. What is not known abroad is the role which these reserves and timber exports have played in the development of Old Russia and building of contemporary Soviet industrial empire. That is why the problem of timber exploitation from the beginning of the Soviet State and particularly its potential in the next decade looms very large on the international economic front. In this respect, the Soviet timber exports from their inception early in the 1920's and factors responsible for their prospective development are pivotal points in this article.

General

When the Soviets took over power in 1917, they also inherited a large stock of sawn lumber accumulated during the period from 1913 to 1917. In the ensuing four years of the civil war and intervention, the volume of stored lumber increased further—the Soviets were neither able to export it abroad nor distribute it in internal markets. At the termination of the confused years late in 1921, the country, which was hard pressed for foreign exchange to pay for imports, naturally turned to this source of income in which the Old Russia had more than two hundred years of successful experience. Now again, the Soviets, facing larger international payments in promotion of the pronounced policy of economic competition in rendering industrial and general assistance to underdeveloped countries and pursuing more than ever the policy of aggressive economic development within the country, have turned to this source of foreign exchange. This answers, at least partially, the query of international financial experts as to the source and means at the disposal of Soviets to meet their constantly expanding international commitments. For it has never been possible that the "yellow" gold production alone would be sufficient to meet the balance of payments. Apparently in the years to come, the exploitation and exports of "green" gold would be a great factor in meeting the situation.

Soviet Beginnings

Under the Soviet regime, the foundation for this trade was laid when the two timber trusts—"Severoles" (Northern timber) and "Petroles" (Petrograd timber) were established to dispose of stored lumber mentioned above. They were both manufacturing and export enterprises, operating independently of each other, and occasionally, even competing between themselves in world markets. This led the VSNKh (Supreme Council of National Economy) and Narkom Vneshtorg (People's Commissariat of External Trade) to establish the TsLEB (Central Timber Export Bureau) with appropriate branch offices abroad. Its functions were research, market studies, policymaking, coordinating and price determination. It did not directly engage in sales activities.

The management of timber exports, however, continued to be unsatisfactory and many weaknesses were found in the operation of TsLEB and timber trusts. This led to the establishment on August 28, 1926, of a Joint Stock Company—"Eksportles"—authorized to handle all trade operations. From 1926 to 1928, it acted as a commission merchant for the timber trusts in export sales. In 1929 it was authorized to take over all operations including the management of port facilities and other local functions in outlets through which timber exports went abroad. On February 6, 1930, it was named All-Union international timber trade monopoly—one of many foreign trade monopolies of the same structure and purpose. Under the statute creating "Eksportles," it was capitalized at 58 million rubles and was authorized to engage in all forest products exports and imports and operate on strict business principles of cost accounting and profitability. In a legal sense, it worked on its own responsibility and in damage suits was liable only to the extent of the property it possessed.

The Soviets claim that "Eksportles" was a vastly more efficient and profitable organization compared with the prerevolutionary, private "free enterprise" type of operations. However, in a technical sense, it continued to operate on the basis of obsolete equipment inherited from the prerevolutionary times. Many ports lacked convenient loading and mooring piers, intra-port and plant transport, loading and unloading mechanisms,

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and managers were forced to handle all physical operations by manual labor and draft horses. Nevertheless, the Soviet managers glory in the fact that as a result of accomplishments in the first two FYP's (five-year plan periods), substantial progress was made in many respects including volume, structure of trade, techniques of management, productivity of labor and in geographic distribution of exports. It should be noted, however, that under all circumstances there would have been progress in various phases of timber exports had it not been for World War I and resulting developments. Therefore, all management and technological successes in international timber trade should be judged on a relative basis. On the other hand, it should be noted and emphasized that the supreme efforts in mobilizing all timber export resources of the country to realize foreign exchange to pay for imports of machinery and technological know-how to facilitate industrialization have been of decisive historical importance for the country.

Statistics of Exports from 1922 to 1940

Starting with an export of about 1 million cubic meters of sawn lumber and saw and veneer logs in 1922, the Soviets continuously increased their exports of timber products including sawnwood (the latter fluctuated between 30 and 50 percent of the total), pitprops, pulpwood, saw and veneer logs, match logs, staves, fuelwood, ties and pulpwood, until in 1930, the U.S.S.R. exported more than 13 million cubic meters of rough and processed wood. From 1930 to 1936, exports fluctuated between 10 and 12 million cubic meters annually. This export volume would probably have continued, if it were not for rising internal requirements, reduced needs for foreign exchange, and the approach of World War II. The decline in exports was steady and progressive from 1937 to the outbreak of war in 1941. Most of the decline at the beginning was in pulpwood exports to Germany and North America, which were reduced from 1,609,000 and 646,000 cubic meters in 1930, to 590,000 and zero, in 1937, respectively. In 1937, there was very little change in the timber trade structure and only a few minor items were eliminated from the trade. By 1940, timber exports were down to 1.6 million cubic meters, just about 8.5 percent of the volume in 1930.

In values, between 1929 and 1937, the ratio fluctuated between 15 and 20 percent of the total export trade and, to the same extent, it paid for imports of machinery and technical know-how. This writer estimates that timber exports in the period from 1922 to 1937 had earned not less than 1.5 billion rubles in more or less hard foreign currencies. By a quirk of fate, timber exports during that period often went to those countries which were able to reciprocate only partially in supplying the Soviet Union with machinery and other capital goods; the remaining favorable balance was spent in the United States for the purchase of tractors and other heavy-duty industrial goods.

Geographic Distribution

Since 1913, there have been substantial changes in geographic distribution of timber exports from various areas of the U.S.S.R. The share of Baltic ports, which between 1917 and 1939 did not include Estonia, Latvia, and Lithuania, and included only Leningrad and Ust-Luga, had declined from 61.1 percent of the national total in 1913 to 35.7 percent in 1930. This decline indicates a considerable depletion of timber stands in this section of the country. On the other hand, exports from the ports of White and Barents seas including Arkhangel'sk, Onega, Murmansk, and a dozen smaller outlets, had increased from 27.6 percent in 1913 to 37.2 percent in 1930. Other large increases in exports were registered from the Pacific ports and other Asia land boundary points including Vladivostok, Mago, and a dozen or so smaller outlets. Finally, there was a sizable export of forest products over the Finnish boundary which increased from 0.1 percent in 1913 to 4.1 percent of the national total in 1930. The rest went abroad through the ports of the Black, Kara, and Caspian Seas.

There are no data for the physical volume of export timber contributed in 1930 by various geographic areas of the country. It is known, however, that in that year the Soviet timber exports were valued at 168 million rubles, of which only about 60 percent were contributed by the basic export timber areas of the Northern Krai, Leningrad, and Karelian ASSR. Of the remaining 40 percent, the Far East territory contributed 6 percent and the remaining 34 percent came from areas other than those adjacent to the exit ports. This shows that as late as 1930, the country's lumber industry, particularly in European Russia, was still nationally mobilized to provide timber exports. This was, no doubt, at the expense of internal consumption. Looking at the same situation from the viewpoint of timber resources distribution, the surplus forest areas of the Northern Krai, Leningrad oblast, Karelian ASSR, Far East Territory and Ural and Corki regions, contributed 78 percent of the total and the remaining 22 percent came out of the deficit areas.

Postwar Period

World War II practically paralyzed all trade relations. Between 1942 and 1945, the volume of timber exports amounted to about 200,000 cubic meters annually. Early in the postwar years, until at least 1949, it was not very clear whether the Soviet Union had any intention of regaining its legitimate place in world timber exports. What with the internal reconstruction requirements and decimated labor force, it looked as if the domestic demand would for an indefinite duration absorb the entire capacity of the industry. Moreover, the lack of bottoms and more urgent uses of internal transportation made the picture for the renewal of timber exports very dark indeed. Nonetheless, beginning in 1949, and more so after 1955, exports began to grow year by year. By 1959 the Soviet Union was exporting about 9 million cubic meters of timber products, or more than three-fourths of the 1930 volume (Table 1). In a sense this trade recovery was accomplished in the space of

TABLE 1.—BASIC SOVIET TIMBER EXPORTS FOR 1913 AND FROM 1922 TO 1959
(In 1,000 cubic meters)

Year	Total	Sawnwood		Pitprops	Pulpwood	Coniferous logs	Blocks	Staves	Fuelwood	Ties	Plywood
		Coniferous	Deciduous								
1913	10,925	4,822	32.0	1,889	2,042	1,270	207.1	76.0	35.3	372.0	60.0
1922	1,008	673	.....	.....	15	301	3.1	6.9	.....	.....	5.6
1923	2,242	1,051	.....	162	310	511	8.7	11.1	5.7	171.5	9.4
1924	3,484	1,383	.....	276	486	932	124.9	31.3	19.1	201.3	12.5
1925	3,831	1,351	.3	181	648	916	204.2	29.3	62.0	205.4	12.7
1926	3,280	1,383	.7	165	698	758	144.1	32.7	15.4	43.0	16.8
1927	4,342	2,074	1.7	375	550	954	176.0	36.8	2.2	129.4	31.6
1928	5,746	2,607	13.4	507	1,142	941	167.4	43.5	14.5	58.4	47.7
1929	9,413	3,873	5.1	990	2,709	971	99.7	58.8	81.0	107.9	85.2
1930	13,026	4,504	13.6	1,806	3,516	1,720	157.4	46.9	64.0	217.7	84.0
1931	10,494	4,466	22.6	1,097	2,582	1,277	96.6	32.1	107.0	94.7	101.2
1932	10,300	4,518	34.4	1,204	2,328	1,321	33.1	30.1	.....	139.6	159.0
1933	11,431	4,593	42.5	1,247	3,269	1,299	28.5	59.9	.....	112.8	151.2
1934	11,785	4,695	47.7	1,489	3,478	1,004	.....	24.5	23.0	135.1	172.3
1935	12,058	4,994	15.5	1,686	3,255	1,045	.....	29.0	4.0	135.8	188.0
1936	10,763	4,583	.7	1,628	2,836	860	.....	22.9	.....	134.9	191.5
1937	8,749	4,173	.....	1,576	1,833	633	.....	.....	.....	145.1	147.9
1938	5,379	3,130	.....	938	876	245	.....	.....	.....	81.1	107.7
1939	2,744	1,355	.....	819	471	28	.....	.....	.....	23.5	3.0
1940	1,591	364	.....	487	625	65	4.9	.....	.....	27.8	17.4
1941	532	304	.....	98	101	.....	.....	.....	.....	14.6	14.3
1942	271	182	.....	33	50	.....	.....	.....	.....	5.8	.....
1943	135	98	.....	17	20	.....	.....	.....	.....	.....	.....
1944	277	164	.....	57	56	.....	.....	.....	.....	.....	.....
1945	288	210	.....	22	56	.....	.....	.....	.....	.....	.....
1946	361	317	.....	23	.....	1	2.0	.....	.....	.7	11.1
1947	586	255	62.2	188	.....	28	14.5	.....	22.0	2.1	13.7
1948	869	448	66.9	138	54	94	18.3	.....	17.7	23.4	8.4
1949	1,734	885	29.8	244	124	84	24.8	.....	163.0	35.2	35.7
1950	2,017	1,037	3.6	378	149	107	41.8	.....	191.6	14.9	52.9
1951	1,509	936	.1	317	1	82	49.4	.....	3.0	35.2	79.5
1952	1,321	749	.....	364	.....	80	46.8	.....	3.5	13.1	62.5
1953	1,950	1,308	.5	437	.....	58	40.9	.....	1.0	25.7	50.2
1954	2,918	1,744	3.4	775	2	60	35.7	.....	78.5	87.5	62.0
1955	4,051	2,337	9.7	839	547	116	44.4	.....	33.5	41.3	92.8
1956	3,954	2,206	2.5	641	528	236	40.1	.....	78.7	113.4	51.2
1957	6,018	3,438	.5	817	591	652	45.3	.....	147.7	223.8	104.8
1958	6,673	3,608	22.5	991	823	986	42.5	.....	.....	93.0	107.5
1959	8,823	4,342	38.3	885	1,181	1,139	48.1	.....	.....	78.1	120.8

Source: Nichkov, V. N. 1959. *Razvitie sovetskogo lesnogo eksporta* (The development of Soviet timber exports). Vneshtorg. Moscow. Appendix No. 1: 262,263. Data for 1958 and 1959 came from Ministerstvo Vneshnei Torgovli, SSSR (Ministry of External Trade of the USSR). Planovo-ekonomicheskoe upravlenie (Economic planning adminstration). 1960. *Vneshniaia torgovlia SSSR za 1959 god* (External trade of the USSR for 1959). *Statisticheskii obsor* (Statistical supplement). Vneshtorg. Moscow. 22.

ten years. Another surprising development was the emergence of the Soviet Union in the past few years as an exporter of pulp and paper products.

Every indication is that the timber trade is going to continue growing at a rate not less than 500,000 cubic meters annually and perhaps much more. By 1965, the country no doubt will again become one of the two largest timber exporting countries in the world, if not the largest. For the present, however, Canada, Sweden and Finland, in that order, are still leading, each exporting 1½ to 3 times as much timber products—rough and processed—as the Soviet Union. It is apparent, however, that whereas there is little room for these countries to expand timber exports, except perhaps for Canada, the U.S.S.R. has hardly begun to realize its potential in this respect. None of these countries, including Canada, has a forest resource comparable to that of the Soviet Union.

Factors Involved in Current and Prospective Trade

There are four paramount, seemingly unrelated, factors which make the U.S.S.R. an outstanding and increasingly important participant in the world timber trade: (1) Building of new agglomerations of industrial complexes in the Northeast and East, based on the new hydroelectric installations harnessing great Russian rivers; (2) its strategically located and state owned timber reserves in the vicinity of the above industrial agglomerations, making their exploitation and creation of forest products processing centers relatively a simple matter; (3) the need for foreign exchange to meet international payments; and (4) the growth of world population and rising standards of living creating new markets and lumber consumers. In the scope of this paper, we are concerned mostly with the second factor—its timber resources, their location vis-a-vis export possibilties, and means of transportation. All other factors are mentioned as incidental to this one.

Pribaltic base.—The so-called Pribaltic area now again includes Estonian, Latvian, and Lithuanian SSR's, Leningrad Sovnarkhoz (regional economic administration) and Karelian ASSR. Ever since Peter I began to introduce western industrialization into the country, this section has been an outstanding lumber and timber export area. During the Soviet period, however, its importance be-

gan to decline relative to the Arkhangel'sk Sovnarkhoz and, in a matter of a decade, exports from this area would probably amount to a mere trickle and the remaining timber stands, except in Karelia, would be able to provide wood for local consumption only. Very little new development could, therefore, be expected from this area, except perhaps in highly processed wood manufactures. For a long time this export base was a prime competitor with Sweden and Finland for Western European markets including United Kingdom, Germany, France, Belgium, and Holland—the most important lumber markets in the world outside the United States which, however, largely developed in the postwar period. However, Karelian ASSR is far from having exhausted its timber riches, but its future lies mostly in the pulp and paper industry rather than in sawmilling and in this direction it will continue to develop both to supply internal markets as well as exports. At any rate, most of Karelian timber outlets gravitate to the White and Barents Seas and that is where its future lies.

Arkhangel'sk base.—At this writing, timber reserves of the Arkhangel'sk Sovnarkhoz, after 300 years of apparent exploitation, still cover 17 million hectares, and their volume is estimated at about 2 billion cubic meters of virgin growth. Although the resources here have been largely depleted along the Northern Dvina, the areas adjacent to the ports of Arkhangel'sk, Onega and Mezen, still cover 9, 2 and 5 million hectares, respectively. They are expected to continue for a long time as the most important timber export outlets of the country. Mature and over-age stands predominate throughout the region, 96 percent of which are coniferous species. In recent years a very large share of the total exports, both as rough and processed timber products, was provided by this Sovnarkhoz. Here are crowded a great concentration of sawmilling and pulp and paper and woodworking establishments. In the city of Arkhangel'sk, they have been processing in recent years not less than 7.5 million cubic meters of roundwood. The plans for 1965 call for at least 100 percent increase in logging, chiefly in the vicinity of the newly completed Arkhangel'sk-Leshukonskii railroad which would provide transportation for about 500 million cubic meters of timber massives (dense stands) located in the basin of the Mezen River, about 200 kilometers east of the city of Arkhangel'sk. In this general area 30 new lespromhkozes (logging enterprises) are being established to be served by over 1,500 kilometers of automobile roads, narrow-gauge railroads and other forest roads, to transport rough timber to the Arkhangel'sk and Mezen sawmilling complexes. These efforts should greatly increase the export capacity of all three ports. The hope is that the expected developments in the Komi Sovnarkhoz (to the northeast of this region) would relieve the pressure of domestic demand on this area and allow it to concentrate more fully on the export phase of its operations. This would mean literally millions of cubic meters of additional supplies of sawnwood for world markets.

Komi base potential.—In the European Northeast, the greatest potential probably exists in the newly created Komi Sovnarkhoz. However, since it is even more conveniently located in relation to domestic markets in European Russia, the development of this resouree base is highly complex and its trade possibilities could be developed in both directions. In this region timber stands have been practically untouched. They cover an area estimated at 26.7 million hectares, holding 2½ billion cubic meters of timber stands, chiefly located in the basin of the Pechora River and mainly denied, for the present, access to the only available port—Narian-Mara—in the estuary of the same river. This is the largest single block of timber reserves of any region in European Russia, 85 percent of which is in over-age and mature stands and 88 percent of the same volume in coniferous species. In 1959, the port of Narian-Mara was still poorly equipped and lacking in transportation approaches and in loading and unloading facilities for large scale operations. A plan has been suggested to create a new port somewhere near the town of Khabarovo, an area said to be protected from the Arctic winds by the island of Vaigach. The new port would serve as an outlet both for the Komi Sovnarkhoz and Western Siberian timber exports. The latter would be delivered here, according to the plan, by linking the town of Salehard in the estuary of the Ob River with the town of Vorkuta at the extreme northeast terminal point of the Pechora railroad which would be extended to the proposed new port in the vicinity of Khabarovo. This would not only open the northern timber riches of Tuimen Sovnarkhoz for exports but prolong the navigable season from 90 to 180 days, twice the length of the season in the Obskaia guba (bay).

Western Siberian base.—Timber stands in this export base immediately involved in Western Siberia in the basin of the Ob River and its tributaries, are located in Tuimen Sovnarkhoz. They are estimated at 4.5 billion cubic meters, of which mature and over-age supplies amount to 3.5 billion or almost 80 percent of the total. The share of coniferous species is 3.0 billion cubic meters. The main timber masses are located in the northern districts of the region and, therefore, gravitate to any available means of transportation in the Arctic. They may become very important exportwise. Here the proposal—which has not reached the blueprint stage at this writing—is to build a new port at the mouth of Ob River. This is an alternative plan to the one already mentioned in connection with Komi Sovnarkhoz. A port in operation now on the left shore of Obskaia guba has a limited capacity and is not suitable for expanding export operations. It lacks mooring piers and loading platforms for deep sea vessels. In the past ships had been loaded here at the waterline directly from barges during a very short season. But this method of operations is slow, limited and expensive. The problem is whether the entire export potential in the basin of Ob-Irtysh Rivers, embracing Ural and West-

ern Siberian natural resources and industries including "inexhaustible" forest resources if the lower reaches of the Ob River, would justify the cost of constructing a modern deep seaport.

Krasnoiarsk base.—Immediately involved in timber exports in Eastern Siberia is the Krasnoiarsk Sovnarkhoz in the Enisei basin. For the size of forest area, it is the foremost economic region of the U.S.S.R. As of January 1, 1956, its forested area was estimated at 107.2 million hectares, or approximately one-sixth of the country's total. The volume of timber on the same date was estimated at 14.5 billion cubic meters, or 19 percent of the national total. Some 12 billion cubic meters, including 11 billion of coniferous species, is mature and over-age timber. The forest area is distributed among types as follows: pine, 29 percent; larch, 26 percent; fir, 15 percent; spruce, 7 percent; Russian kedr (stone pine or cedar), 7 percent; birch, 13 percent; and poplar, 3 percent. This Sovnarkhoz has been exporting a surplus of timber products for more than 30 years and will have much more to export by 1965, when it is expected to rank only behind the Arkhangel'sk and Irkutsk Sovnarkhozes in logging. Here the expansion of integrated forest products industries goes apace with a rapid increase in population and construction of hydroelectric installations.

The fame of the Krasnoiarsk sovnarkhoz as an exporting area is based on the port of Igarka, a little below the estuary of the Enisei River where high and low tides do not reach. It is considered a convenient port with 5 loading and unloading piers. Plans are in a sufficiently advanced stage to expand its capacity three times and to make an even more convenient exit abroad for a constantly increasing volume of timber and pulp and paper goods. The port is deep enough to provide convenient berth for oceangoing vessels which also could be loaded from the roadstead. Export goods will be delivered here from all parts of the Enisei basin in a large number of lighters, pontoons and self-propelled barges. In addition, the town of Igarka has its own newly built sawmilling establishments plus extensive warehousing and yarding facilities and a great deal of room for expansion to handle a large volume of forest products. It should be noted, however, that the Igarka port, just as the port of Salehard at the mouth of the Ob River, has to squeeze its export activities into a 90-day navigation period and that seagoing vessels can make only one trip per year (during July, August, and September) to that port. Its development will be restricted unless some way is found to utilize the northern sea route for more than three months a year. In this respect, a great deal of exploratory work is being conducted.

New waterway for timber exports.—All five timber bases considered so far are more or less conveniently located to cater to world markets situated in the westerly direction. The markets include the United Kingdom, Belgium, Holland, France, Germany, and some 30 other countries. The Soviets have had more than 35 years experience of exporting timber products to these countries. However, recently, a new waterway—the Volga-Don Canal—has entered the picture. It is a most elaborate "grand trunk line," linking the White-Baltic-Caspian Seas with the Azov and Black Seas into one great water transport system. It is intended chiefly for carrying bulky commodities — coal, cement, oil, grain, and timber. Great hopes are entertained that it would make economically feasible the supplying of the deficit forest areas in the South with timber products from the rich reserves of the Volga and Kama basins. But it is also claimed to create favorable conditions for the transport of forest products to the Near East and Mediterranean regions, where the standard of living is rising and where timber products will be consumed at an increasing rate. Thus the Soviet Union hopes to be on the ground floor in developing for itself markets in Iran, Turkey, Iraq, Lebanon, Israel, United Arab Republic, Libya, Greece, Tunis, Algeria, Italy, and Morocco. Before World War II, this area imported approximately 3 million cubic meters of timber products. Of this volume, the U.S.S.R. supplied 15 to 20 percent, chiefly through the ports of Novorossiisk, Kherson, and Odessa on the Black Sea where the shipments would arrive by railroad. But these ports have lost their standing since the adjacent timber reserves have been exhausted and are now hardly sufficient to meet the local needs. Thus the Volga-Don system looms large in export plans. It is suggested that timber products be carried from the North in river boats and barges to the Azov Sea and there be transferred to sea-going vessels at a special port to be constructed at the mouth of the Don on the shores of the Azov Sea. The Soviets claim that this is the most economical way of supplying the above-mentioned countries and they expect to compete successfully in these markets with timber shipments from Sweden and Finland. Whether or not the hopes for this water system will materialize in this respect remains to be seen. But there is no doubt that the U.S.S.R. will become the main source of wood products for the countries of the Near East and Mediterranean regions, and perhaps, some countries in South America. Canada, although still possessing considerable reserves, is busily engaged in supplying forest products to the United States—the best and most constantly expanding market in the world. Canada could not be considered for the present to be in direct competition with the Soviet Union in world markets other than in Latin America and Pacific countries because of higher costs of production and distribution.

Far East base and Pacific trade.—The Soviet Far East is the sixth timber export base in the U.S.S.R. Its forest area embraces 100.9 million hectares, including these areas of export significance: 40.7 million in the Khabarovsk krai, 8.3 million in Primorsk krai, 20 million in Amurskaia region and 4.3 million hectares on the island of Sakhalin. The remaining 26.7 million hectares of timber stands located in Chitinskaia region and elsewhere are of no present export significance. Coniferous stands predomi-

nate on 80 percent of the forest area. About 50 percent of the timber volume estimated at 11.6 billion cubic meters is larch, 17 percent is fir and spruce, and 5 percent is Russian kedr and pine. Among deciduous species, birch comprises 75 percent of the total, oak 10 percent, and the rest includes elm, ash, maple, aspen, linden and Velvet Amurskii. The latter is the only cork tree in the U.S.S.R. having industrial significance. The territory's ratio between coniferous and deciduous species is 7½ to 1, and mature and over-age stands comprise 85 percent of the total reserves. The wood of the coniferous species is distinguished by highly valued physical and mechanical properties and beautiful texture. The latter quality is particularly evident in the Russian kedr which is even better than the Kaga (sea pine), growing in the Enisei basin and highly regarded in world markets. Wood of Dahurian and Okhotsk larch is also highly valued for its physical and technical properties. It is moisture resistant and, therefore, widely used for hydrotechnical works and also in cutting of ties, slippers, and beams for paving and sawmilling. The Far Eastern ash, oak, white and yellow birch, and linden are suitable for parquet flooring, staves, building parts and plywood, in addition to being suitable for sawing, veneer, furniture, and pulp and paper processing. Its logging volume at present amounts to 6.5 percent of the national total.

The Soviet Far East, in the light of its timber resources, is considered for the present underdeveloped in exploitation, processing, and exports. It is the most isolated Sovnarkhoz from the rest of the country. It lacks population as labor and consumer factors and could depend only for the development of forest products industries on increasing consumption within the region or export marketts in the Pacific area over the ocean lanes.

During the first FYP, timber products from this territory were shipped abroad through 19 outlets on the Continent and from a few points on the Island of Sakhalin. Only two of these, Vladivostok in the south of Primorsk oblast and Mago on the Amur River were more or less equipped with modern facilities. Since then many new ports have been established and equipped with modern machinery. The Amur River basin remains the main artery of timber exports. Here the Soviets are creating large forest products centers including a pulp and paper combine to process export goods for shipment through Mago Bay. The same plans on a smaller scale are being realized in the districts adjacent to Cape Lazarev, the Bay De Kastri, and the Vanina serving the Northern Siberian trunk line. All ports mentioned above are facing the Gulf of Tartary. South of these, facing the Sea of Japan, are the ports Nakhodka and Vladivostok which serve as export outlets for forest products centers along the southern Siberian trunk line, ending in Vladivostok with a branch line to the port of Nakhodka. There are also many secondary export outlets chiefly for the exit of floatable and raftable roundwood to Japan. This method of transporting timber across the Japanese Sea is a recent development in Soviet exports. There are also smaller ports located along the entire stretch of the Pacific shore line fronting Japan.

There are also outlets for timber exports to China through the Sungari River (which is a branch of the Amur River) and at about a half-dozen land boundary points at which the Chinese branch lines intersect the Great Siberian trunk line, from the town of Voroshilov in the east to the town of Manchuli in the west. However, when the Chinese import market fully develops, no doubt, the main exports to that country will go over the Seas of Japan and China to its Southeast Asian ports. For the present, Japan is the largest importer of saw and veneer logs from this territory. However, the future of that market is highly speculative and competitive. In the first place, the Soviets would be anxious to process as much roundwood as possible within the territory. On the other hand, Japan has a great wood processing industry of its own and, therefore, would be anxious to continue importing as much roundwood as possible—which they have been doing in the postwar period, particularly since 1951. Japan has at least two large sources of rough timber, the Soviet Far East and the Philippine Islands, and a few lesser sources in the South Pacific and Southeast Asia. Nevertheless, in my opinion, the Soviets will probably dominate a good share of that market in the next decade, as they will the Chinese timber and lumber imports. These two markets could absorb 3 to 5 million cubic meters of rough and processed wood if they had foreign exchange freely available. Other markets in the Pacific which the Soviets could dominate partially for geographic reasons, if for no other, in the next decade, are Australia, which imports a considerable volume of both rough and processed wood, and Hong Kong, also a highly speculative and undependable market which along with China was a dumping ground before the war.

Economic Significance

Although Soviet timber exports have been gaining since 1949, their ratio to the total export trade has been declining when compared to the 1930-1936 period and will probably never return to their former position in the structure of the trade, relatively speaking. This should have been expected in the light of Soviet industrialization and higher values attached to other manufactured exports. It is not likely, on the other hand, that the U.S.S.R. will import more processed forest products than it has been doing in the postwar period and probably much less. At any rate, the payments for wood imports would have very little or no relation whatsoever to the international balance of payments involving hard currencies for reasons discussed below. Very briefly, then, the Soviets will be able again to build a respectable income in foreign exchange from this source to apply to its other international expenditures. But the real significance of timber sales is in the fact that as a foreign exchange earner, it is sold almost entirely outside the communist dominated countries as a more or less noncompetitive com-

modity. Thus the U.S.S.R. is able to obtain through this trade large sums in foreign exchange and credits freely expendable anywhere in the world to meet its obligations in connection with aid programs to less developed countries. It is doubtful that any other phase of the Soviet exports is as favorably situated as timber exports in this respect, because most of its international trade, both exports and imports, is with other communist countries which would be a limited source of foreign currency for payments outside the "family circle."

What are the actual returns from this trade? We have already discussed what the "lowly" wood has done for the industrialization of the country from 1922 to 1940. Similarly it would be difficult for the U.S.S.R. to compete with the free enterprise United States in meeting its international obligations in the present struggle, including aid to underdeveloped countries, unless it is able to derive from this source substantial funds of the order of one-half to one billion dollars annually. What are the facts to support this speculative projection? We have already seen in Table 1 that the volume of exports had increased from 1.7 million cubic meters in 1949 to 8.8 million cubic meters in 1959 and the value received for those exports had increased at the same or a higher rate, making allowance for higher prices. By 1956, the Soviets sold in world markets timber products worth $117.5 million, further increasing the value to 213 million in 1959 (at the official rate of exchange: 4 rubles equal to 1 dollar, before the recent revaluation) (Table 2). Assuming that the plans for forest products complexes in the above described timber bases materialize by 1965 or at the end of the current seven-year period, the Soviets would be able to export annually around 15 million cubic meters of timber products valued at $350 to $450 million.

TABLE 2.—VALUE OF TIMBER EXPORTS FROM THE U. S. S. R. (IN 1,000 RUBLES AND 1,000 DOLLARS)

Items	1956	1957	1958	1959
Coniferous sawnwood	343,000	538,282	545,648	598,245
Sawlogs	20,520	45,587	58,807	70,587
Pitprops	35,160	45,255	54,210	50,419
Pulpwood	28,320	32,957	41,920	49,945
Building timber	....	1,124	7,358	14,522
Logs for matches	....	4,931	4,545	5,678
Veneer logs	....	1,802	1,778	1,497
Plywood	20,880	40,636	50,460	53,209
Veneer—cut sets	....	1,765	1,654	602
Ties	21,200	40,069	14,785	9,610
Match sticks	....	311	322	358
Total in rubles	479,080	752,719	781,497	854,752
Total in dollars (in 4 to 1 ratio)	117,465	188,177	195,374	213,688

NOTE: Data for sawlogs for 1956 include veneer and match logs. Data for veneer sets, building timber and match sticks for 1956 are not available, but data for the same items from 1957 to 1959 show them to be small and inconsequential.

Soviet Timber Imports

The U.S.S.R. is presently also an importer of timber and pulp and paper goods. They began after the Soviet-Finnish war in 1939, on account of reparations at first, but continued and even expanded for a short time on a free trade basis. Imports in Table 3, when compared with exports in Tables 1 and 2, show them to be considerably smaller in volume and value. However, at one time, from 1949 to 1951, they almost balanced. By 1953, however, the reparation payments were completed and paid-for timber products imports became much smaller. There is good reason to believe that in a few years, the imports of rough and processed wood will disappear except for hardwoods and a few specialized manufactures and some pulp and paper goods.

Except for Finland and Austria which trade-wise gravitate to Eastern Europe, all imports have been coming from the communist countries and are a part of "accommodative" reciprocal trade relation in Eastern Europe. Coniferous sawnwood and pulpwood were chiefly imported from Finland and Rumania, and sawn oak from Yugoslavia. These countries could be considered as basic suppliers of a large variety of timber products to the U.S.S.R. But the country has also been receiving recently veneer sets from Austria and Albania and wooden furni-

TABLE 3.—RECENT U.S.S.R. TIMBER PRODUCTS IMPORTS: STRUCTURE, VOLUME AND VALUE
(IN 1,000 CUBIC METERS AND 1,000 RUBLES)

Items	1957 Volume	1957 Value	1958 Volume	1958 Value	1959 Volume	1959 Value
Sawnwood						
Veneer box materials	371.1	213,305	467.5	215,209	254.1	186,590
Coniferous	252.5	42,829	183.9	31,829	121.2	18,286
Deciduous	165.1	43,267	183.7	47,588	215.3	55,985
Box sets	164.5	48,978	152.4	43,530	149.4	41,702
Roundwood or logs all kinds	....	....	340.0	21,783	213.8	12,266
Pulpwood	363.3	21,755	302.2	14.991	188.3	7,631
Plywood	10.7	6,002	9.5	5,488	14.2	8,194
Ties	371.1	5,255	467.5	5,860	254.1	4,292
Veneer sets (in million square meters)	5.5	8,793	5.6	9,134	8.1	12,663
Barrel sets (in million pieces)	1.0	27,453	1.1	24,390	1.2	25,935
Barrels (in 1,000 pieces)	57.2	4,412	74.5	5,738	12.2	4,613
Veneer box material sets (in million pieces)	1.8	4,561	2.0	4,878	2.0	5,053
Total (in 1,000 rubles)	....	213,305	....	215,209	....	196,590
Total (in 1,000 dollars)	....	53,326	....	53,542	....	49,147

SOURCE: Vneshniaia torgovlia SSSR za 1958 i 1960 gody (External trade of the USSR for 1958 and 1960). Statisticheskii obsor (Statistical review). Vneshtorgizdat.

ture from Bulgaria, Hungary, East Germany, Poland, Rumania, Yugoslavia, China, Czechoslovakia, and Vietnam. With these countries no particular problem of settling the balance of payments exists and no exchanges in gold or hard currencies are involved. The total wood products imports including high grade pulp for textile, paper goods and cork bark, and chips amounted in 1957 to 488 million rubles; in 1958, to 429 million; in 1959, to 547 million rubles. In all three years, practically the entire increase in imports was on account of large purchases of high grade cellulose for artificial fabrics and paper and cardboard materials for boxes and readymade boxes. These imports will continue only for two or three years until plants for their manufacture, which are being constructed, begin their operations. There is no doubt that the Soviet Union itself will become, by 1965, a large exporter of these products except cork and chips.

Summary and Conclusions

The study distinguishes two periods of the U.S.S.R. international timber trade which normally consists of exports and only occasionally includes imports. During the period from 1922 to 1940, the country's entire timber and sawmilling industry was virtually mobilized for exports. The proceeds from this period literally paid for imports of machinery and technological know-how which laid the foundation for industrialization of the country. In the current period, from 1949 to 1965, again, timber exports bid fair to become the most important source of foreign exchange needed for the new policy of economic competition. Now exports are based on a most comprehensive nationally planned timber economy and integrated forest products industries. These will comprise only a small part, 10 to 15 percent, of the national output, which, however, are able to realize more returns in world markets than any other single group of manufactures.

Purely from the viewpoint of forest management and exploitation, we should not lightly dismiss the national and international implications of Soviet timber exports in the immediate and distant future on conservation and multiple-purpose efforts in the countries of the Northern Hemisphere where timber stands are scientifically managed. In the U.S.S.R. they will slow down further decay and waste of the national wealth.

Finally, American and other western foresters working as technical aids to the timber-rich countries of Asia, Latin America, and Equatorial Africa could draw important lessons from the Soviet history of timber exploitation and exports. Countries they serve could, just as the Soviets did, literally lift themselves by their own bootstraps, if they find themselves in the same position, as the U.S.S.R. found itself in the 1920's. At that time, the Soviet Union's credit abroad was practically nonexistent and at home there were no evident values on which the credit of the nation could have been suddenly established. Relatively very small investment is needed to start felling trees on a modest scale and gradually stimulate progress of various forest products industries. Moreover there are always lucrative markets in Europe and the United States for exotic woods. Through this means, Sweden, Finland, Canada, and now the U.S.S.R. have built great industrial civilizations in good part by the use of their timber wealth.

References and Sources of Data

1. ELCHIBEGOFF, IVAN M. 1960. Planning in the timber economy of the U.S.S.R. 1960. (Unpubl. monograph. 81 pp.)
2. ————. 1960. Economic and technical history of sawmilling in Old Russia and U.S.S.R. (Unpubl. monograph. 106 pp.)
3. ————. 1960. The pulp and paper industry of the U.S.S.R. (Unpubl. monograph. 170 pp.)
4. LUR'E, N. A. 1959. Vneshniaia torgovlia SSSR lesomaterialami (External trade of the U.S.S.R. in timber products). Lesnaia promyshlennost (Timber industry—monthly periodical). 12:28 and 29.
5. MINISTERSTVO VNESHNEI TORGOVLI (Ministry of External Trade). Planovo- ekonomicheskoe upravlenie (Economic planning administration). 1960. Vneshniaia torgovlia SSR, za 1959 god (External trade of the USSR for 1959). Annual statistical supplement to Vneshniaia torgovlia—monthly periodical). Moscow.
6. NICHKOV, V. N. 1934. Portovoe lesoeksportnoe khoziaistvo (Port management in timber exports). Goslestechizdat, Moscow.
7. ————. 1959. Razvitie sovetskogo lesnogo eksporta (The development of Soviet timber exports). Vneshtorgizdat, Moscow.

Stratification for Timber Cruising

C. Allen Bickford

Proper use of stratification offers an effective means of reducing the cost of a timber cruise. Yet few foresters have a clear understanding of how to use this technique. The purpose of this paper is to increase understanding and to stimulate foresters to use classes when they cruise.

IN STATISTICAL texts the method is treated under the heading of "stratification," with a liberal use of symbols. This is a poor start for the ordinary forester who only wants a good estimate of the amount of timber on the area. Stratification simply means the use of classes. As applied to sampling, which includes timber cruising, these classes should be so defined that individuals within a class are alike while those in different classes are not alike. Such classes result in less variation within a class than there is for the whole area. In terms of timber cruising, use of such classes means that less work is needed to achieve the accuracy desired.

What It Is and How It Works

Statisticians have known for a long time that proper use of stratification would result in far more efficient sampling. To achieve this gain there are three requirements: (1) Strata must be defined independently of the sampling to obtain class averages; (2) There must be real differences among these class averages; and (3) There must be a proper distribution of observations by classes.

Independence in defining strata means that somehow or other the distribution by classes must be obtainable before individual trees are selected to determine averages by classes. For purposes of a timber cruise there are many criteria which might serve to define classes: geography, forest type or stand condition from previous map, aerial photographs, a preliminary ground sample, etc. The most effective procedure presently available is the combination of recent high-quality aerial photographs and a skillful photo interpreter.

The second requirement for efficient sampling is real differences among the averages by classes. Two averages are important: the ordinary arithmetic average, or the mean, and the average squared deviation from the mean, or the variance. The greater the differences there are among the class means the more advantage there is to stratified sampling in comparison with simple random sampling. What it amounts to is that effective use of classes reduces the variation among individuals of the same class by increasing the differences among class means.

The third requirement is a proper distribution of the observations by classes. There are two proper ways depending on whether or not variance within strata is the same from one class to another. If it is, allocation that is proportional to strata weight gives the desired distribution. In timber cruising, area of the class is the weight of the stratum. If class variances are not equal, proportional allocation is still acceptable and proper although optimum, or Neyman, allocation is more efficient; i.e., desired accuracy is obtained at less cost. Optimum allocation means that observations are distributed proportional to the product of class area and standard deviation of the class. (Standard deviation is the square root of the variance.) Equal numbers by classes might have some intuitive appeal but is less efficient than proportional, or optimum where it is proper. It is also possible, of course, to have numbers of observations that are neither equal nor proportional, and in such a case there may be no advantage to stratified sampling. Small departures from either proportional or optimum, however, reduce their efficiency very little.

From the foregoing it can be seen that geographic units such as counties, townships, or watersheds may not provide much gain from stratification as appreciable differences in the means are unlikely. Forest types may be little better. Aerial photographs, especially those on which it is possible to measure differences in stand height, density, and so forth—the factors likely to affect volume—may result in substantial gains using stratified sampling to estimate volume.

As regards distribution by strata, it should be evident that optimum allocation is limited in practice to fairly simple objectives. Optimum for total volume in cubic feet is not likely to be also optimum for board-foot volume, growth, or distribution of area by classes. Real differences in the variances are also essential to the efficiency which is possible from optimum allocation.

Using Classes to Cruise Timber

For timber cruising, aerial photographs provide the most practical basis for defining the classes needed for stratified sampling. Classes may be defined by a multitude of criteria but the most effective are those most strongly related to the quantity it is desired to estimate.

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The usual purpose of cruising timber is to estimate volume. In this case, the most effective classes are those which reduce volume variation within classes, or what is the same thing, those which increase variation among the class means.

There are two principal alternatives, depending upon the prospective use of the data: (1) delineation of strata on the photos themselves, or on a map, and (2) the classification of points or plots as the first step in double (or multiple) sampling.

A forest manager needs to know where the timber is, as well as the total volume on the area. For his purposes strata should be delineated. From these delineations and averages by classes he will be able to estimate volume for any smaller area without additional field work. But before acting upon such data alone, it may be desirable for him to make a check since there could be errors of delineation, or the class means may be too high or too low. Where some minimum accuracy is important, as in selling stumpage, additional sampling may be required.

Where the objective is to know total volume for a large area, such as a state, and distribution of the volume is unimportant, double sampling becomes more efficient because it is easier and less costly to classify points than it is to classify the whole area and draw lines along class boundaries. For this use it is enough to classify a large number of points on the photographs to determine area by strata and a subsample of these points to determine corresponding averages. This is the procedure used for the initial forest survey of the Northeast.[1]

In either case, distribution of the sample may be proportional or optimum as has been described.

The Data Used to Illustrate Stratified Sampling

In making the initial forest survey of Maryland's "Eastern Shore," 8,042 photo plots and 383 ground plots were used. Here, the standard design for the Northeast[1] was modified by taking extra nonforest plots for the Maryland Department of Game and Inland Fish. There was a gross area of 2,165,100 acres of which 882,500 acres were forested.[2] The resultant sampling error was estimated to be 4.3 percent of the total net volume in cubic feet (885,600,000).

Table 1 shows other results of this survey.

Data of Table 1 may be used to estimate means and variances when fewer strata are employed including a simple random sample.[3] Thus we are able to compare the efficiencies of some sampling alternatives in terms of the numbers of ground plots required to attain the same sampling error. The alternatives shown below were selected on the basis of expected interest to foresters.

Plots Needed to Obtain Some Sampling Error

The methods used: double sampling using aerial photographs, optimum allocation to forest strata with additional nonforest plots, as noted. Forest survey experience elsewhere was used to calculate numbers of photo plots and ground plots and the distribution of the latter by strata. As shown in Table 1, 383 ground plots were used.

The first alternative considered was true optimum allocation, after using the 8,042 plots to determine area by strata. This assumes that we knew strata means and variances before we sampled. The number so computed was 223 plots which is 160 less than were actually used.

The second alternative would use photo plots as above and proportional allocation of a sufficient number of ground plots. This number was computed to be 777, which is more than twice the number used and more than thrice the number that would have been required for optimum allocation.

The third alternative would use only two strata: forest and nonforest, based on 8,042 photo plots with optimum allocation to strata. The number so calculated was 466 which is more than twice the previous optimum and shows that the six classes of forest would have saved 243 ground plots.

The fourth alternative would also use two strata as did the third, but with proportional allocation. The resultant number was 1,240 ground plots.

The fifth alternative was a simple random sample[4] composed entirely of ground plots. The number so computed was 2,031, approximately one ground plot for every thousand acres.

As foresters are usually less interested in sampling nonforest land, the problem was redefined for forest land only: 882,500 acres, 3,001 photo plots, 235 ground plots, sampling error still 4.3 percent and recognizing the same six classes in photo interpretation. For this situation, the following numbers of ground plots were calculated:

Optimum	224 ground plots
Proportional	290 ground plots
No strata	466 ground plots

[1] Bickford, C. A. The sampling design used in forest survey of the Northeast. Jour. Forestry 50:290-293. 1952.

[2] Northeastern Forest Experiment Station. Forest statistics for the eastern shore of Maryland. Forest Stat. Ser. Md. 3. 17 pp. 1954.

[3] Cochran, W. G. Sampling techniques. John Wiley & Sons, Inc., New York. 320 pp. Chapter 5, especially page 77. 1953.

[4] A systematic sample was not included because there is no unequivocal procedure for estimating the number of plots required.

TABLE 1.—MARYLAND UNIT 1—BASIC DATA

Photo volume class	Photo plots	Ground plots	Average volume	Standard deviation of volume
	Number		*Cu. ft. per acre*	
1 & 2	807	96	1,879	1,166
3	699	43	1,215	503
4	545	44	1,023	579
5	253	11	876	336
6	167	10	241	209
7, 8 & 9	530	31	159	314
0	5,041	148	*	*
Total	8,042	383	.....	.....

*Greater than zero but trivial.

These numbers are small in comparison with two-way stratification because of the six classes used to reduce within-class variance on forest land. More plots are required for no strata here than under the third alternative because of the 8,042 plots that were used earlier.

Discussion

The comparative results shown above are not necessarily what one should expect from every application of stratified sampling. Conditions were favorable for showing advantage to the method in two important aspects: (1) the quality of the photographs was higher, they were interpreted promptly, and all ground plots were established within about a year and a half after flying; and (2) photo interpretation was of better than average quality. With older photographs, changes due to cutting, fire, wind, growth, etc., tend to reduce differences among strata means and to inflate variation within strata. However, it is easy to overstress the impact of these changes. It has been our experience that aerial photographs are useful over longer periods than has been supposed. Still, the results obtained by forest survey in this area are not beyond the capacity of others who could use aerial photographs to stratify and so reduce the amount of ground work which is commonly the most expensive part of timber cruising.

The number of plots that have been computed stress the importance of four points.

1. An appreciable departure from optimum sampling was still much better than any of the alternatives considered. This is important to anyone who might use this procedure in timber cruising. Approximate values for the means and variances are good enough for planning an optimum sample in many cases. Strata areas may be determined from the photographs before even computing the numbers of ground plots or their distribution by strata. For a simple objective it is likely that the cost will be appreciably less than under any of the alternatives.

2. The second point that can be stressed from the data is the tremendous advantage of stratification to an extensive forest survey for estimation of total volume. More than five times as many ground plots would have been needed without strata and about nine times as many had the planning data been better. When differences like these can be obtained, it is more efficient to purchase the photography, including the flying, than to rely solely on ground plots.

3. The third point is the limited advantage of using only forest and nonforest as strata. Even with optimum allocation, nearly a hundred added plots would have been needed or more than twice as many as optimum with seven strata. Seven may actually be too many, but when only two strata are used, full advantage of the capabilities of photographs is not realized.

4. The final point is that when nonforest land is eliminated a sizable advantage still remains. Nearly twice as many ground plots as were actually used would have been needed for a simple random sample. The differences among numbers for the three variations in stratification were smaller but these numbers were in the same order as before. Few forest managers will be concerned with as much as 880,000 acres of forest land. Those who have to sample smaller areas may wonder if stratification will help them too. The answer is yes if differences exist that can be used in the manner described. The smaller the area is, the less likely it becomes that usable strata will be found. With a thousand acres or more one should look for usable strata. With as much as 40,000 acres they are almost invariably present.

Stratification is a tool that foresters have neglected too often in their timber cruising. For effective use, stratification should be adapted to meet the purposes of the particular cruise. In some cases, the savings in cost from stratification are great enough to offset the costs of flying and photography. And when photographs have been obtained for some other purpose and are available, it is extravagant to fail to use them.

The September Issue of Forest Science

Titles of articles appearing in *Forest Science* for September are as follows: "The Persistence of DDT in a Forest Soil"; "Intraspecific Competition as a Factor in the Natural Control of the Douglas-Fir Beetle"; "Maturation of Douglas-Fir Seed—A Biochemical Study"; "Salt Secretion by *Tamarix pentandra* Pall."; "Rot Entrance Through Dead Branches of Southern Hardwoods"; "Air-Layering of Lodgepole Pine and Origin of Adventitious Roots"; "Reduction in Peak Discharges Associated with Reforestation"; "Stand Development and Soil Fertility in a Douglas-Fir—Red Alder Plantation"; "Intraspecific Root Grafting and the Survival of Eastern White Pine Stumps"; "Variations in Total Solar Radiation in Three Norway Spruce Plantations"; "A Method for Calculating Error of Soil Moisture Volumes in Gravimetric Sampling"; "Responses of American Basswood Seedlings to Several Light Intensities"; "A Computer Technique for the Study of Forest Sampling Methods"; "Forestry Theses Accepted by Colleges and Universities in the United States, Supplement July 1959-June 1960."

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Portable Mistblower Spray Tests Against White Pine Weevil in New York[1]

Donald P. Connola

THE white pine weevil (*Pissodes strobi Peck*) is considered the most important insect pest attacking eastern white pine (*Pinus strobus L.*) in the northeastern United States. Its attack on the terminal leaders of white pine results in the loss of 2 to 3 years, and often up to 5 years, of terminal growth. The damage causes lateral branches to assume the lead, resulting in a crooked or forked tree with little commercial value. Studies made in New Hampshire by Waters et al. (*3*) showed an average loss of 40 percent in the board foot volume of white pine sawlogs resulting from attack by white pine weevil. Thus, attack by this insect makes reforestation with white pine unprofitable in many areas of the Northeast.

The weevil attacks Norway spruce (*Picea abies* [L.] Karst) in many areas with as much vigor as it attacks white pine. It also occasionally attacks other conifers including Scotch pine (*Pinus sylvestris* L.). Attack on the latter can be serious locally, especially when trees are being grown for use as Christmas trees.

Various methods of control of the white pine weevil have been tested. Connola et al. (*1*) showed that control of the weevil was feasible by aircraft application of DDT at a cost of $2.50 to $4 per acre. The method is particularly suitable for spraying large acreages where time or cost factors or both would make spraying from the ground impractical.

Crosby (*2*), working with small acreages, reported good control of white pine weevil with emulsions of several of the chlorinated hydrocarbon and organo-phosphate insecticides applied to terminals of white pine with a knapsack-type hydraulic sprayer. Applications of the insecticides were made in the fall or spring prior to weevil emergence. Cost of treatment, according to correspondence with the author, varied from $4 to $8 per acre depending on the height of the trees, the number of leaders per acre, and density of ground cover. The chief advantage of the method is that, except during periods of freezing temperatures, application of the insecticide may be made at any time from fall until spring prior to weevil emergence. The method has three chief disadvantages. It restricts spray applications to trees that can be reached by hand and because the insecticide must be applied to individual trees, it is slow and expensive.

The main purpose of the tests with a portable mistblower was to develop a method of insecticide application which could be used by individuals on small plantings and which would be faster and cheaper than the hydraulic method used by Crosby.

Methods and Materials

The tests were undertaken in 1958 using a Kiekens Dekker, Model 60, knapsack-type mistblower (Fig. 1). The machine, which weighs about 25 pounds, was manufactured by Kiekens Mistblower Factories in Holland and has a 2 cycle, 1.5 horsepower, gasoline motor. Effective spray distance, according to the manufacturer, is 30 feet. The insecticide is carried in a 1.3 or 2.5-gallon container which is suspended from the shoulder straps and hangs in front of the operator. This not only tends to balance the weight of the machine which is supported on the back of the operator, but also permits the replacement of empty containers with full ones without removing the machine from the operator or stopping the motor. Thus, with 2 or more containers, an operator can be continuously supplied with

FIG. 1.—The Kiekens Dekker portable mistblower in operation with nozzle extension tube attached. Note insecticide container hanging in front of operator.

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[1]Published by permission of the assistant director, New York State Museum and Science Service, Journal Series No. 47.

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spray mixture.

During 1958 and 1959, preliminary tests were made with the mistblower using various formulations of some of the newer insecticides including some suggested by Crosby's (*2*) work with hydraulic sprays and others suggested by aircraft spray tests reported by Connola et al. (*1*). Results of these tests showed that lindane and DDT emulsions in water were the most effective of the insecticide formulations tested for control of the weevil.

In selecting the insecticide to be used in the final tests in the spring of 1960, preference was given to DDT because of its low cost as compared to lindane. The cost of 25 percent emulsifiable DDT was $1.75 per gallon whereas the cost of 20 percent emulsifiable lindane was $9.80 per gallon.

The equipment used to apply the spray was the same mistblower described above (Fig. 1) but with the 6-inch copper tube nozzle extension, shown in the photo, removed. The spray was directed toward the white pine leaders while spraying 4 rows of trees at a time. Delivery of the spray to the far rows appeared to be better without the extension tube, especially since there was a loss of spray from drip off the end of the extension tube. The apparatus was operated with the fluid delivery at three-quarters of its capacity and the air delivery at its maximum volume and velocity. Thus, the mistblower was calibrated to deliver 3 gallons of spray per acre when the operator walked at a normal pace along the rows, spraying 4 rows of trees at one time. Spraying time was 45 minutes per acre, thus averaging 15 minutes per gallon for spray delivery.

Application of the spray was made on April 11, 1960, just prior to weevil emergence. Weather was satisfactory for mistblower spraying. Air temperature was 40° F., and the day was clear with winds from 5 to 10 miles per hour. The wind was used to advantage in drifting the spray mist to the trees. Spray cards placed in the treatment plots indicated that the spray distribution and deposit were satisfactory throughout the plots.

The tests were made on a 4-acre white pine plantation which had numerous open areas where trees had not survived. Original spacing of the trees was 6 feet by 6 feet. Estimated tree survival was about 60 percent. Weevil attack on the surviving trees, prior to spraying, was very heavy. The trees ranged from 1 to 6 feet tall with the average being about 4 feet. The untreated check area which was about 1 acre had trees which were slightly taller. It was located about ¼ mile from the treated area.

The treated area (4 acres) was on a hillside and was divided in half by a string line and plastic tags which were attached to trees along the line. The lower half of the plantation (Plot 1) was sprayed with a 6-percent DDT-in-water emulsion (½ lb. DDT per gallon of spray). The upper half (Plot 2) was sprayed with 6 percent DDT plus 1 percent Aroclor in water emulsion. The latter (Aroclor) is a resinous material sold by Monsanto Chemical Co. for use as a sticker for insecticides. The average per-acre cost of spraying was $3.25.

For evaluating the results, two random counts of 100 trees each were made in each of the plots and the number of weeviled trees in each count was recorded. The counts in each plot were made along two diagonal lines which crossed in about the middle of the plot. One count was made along each line. The two counts of weeviled trees were combined to give the percent weeviling in each plot. The percent weeviling in this report indicates the percent of trees that had been recently weeviled. Counts were made prior to spraying to give the percent weeviling in 1959 and then again in September 1960 to give the percent weeviling after spraying.

Results

Results of the tests in the spring of 1960 showed that weeviling was reduced in both spray treatments (6 percent DDT with and without 1 percent Aroclor) from 55 percent in 1959 prior to spraying to 1.5 percent in 1960 after spraying. Weeviling in the untreated check area increased from 32 percent in 1959 to 59 percent in 1960.

The year 1960 was generally favorable for weevil activity in the northeastern states.

Conclusion

It is concluded that damage by the white pine weevil can be controlled satisfactorily by the use of a portable mistblower to apply the insecticide under suitable spraying conditions just prior to weevil emergence in the spring. Results of tests with DDT showed satisfactory reduction in weevil damage when used at a 6-percent concentration and applied at the rate of 3 gallons per acre (1½ lbs. DDT per acre).

Summary

Preliminary portable mistblower tests with various insecticides for control of the white pine weevil were made in 1958 and 1959. Results of those tests indicated that the portable mistblower could be used successfully for weevil control and also that lindane and DDT were the most promising of the insecticide formulations tested.

Final tests were made in the spring of 1960. DDT was selected for use in the tests in preference to lindane because of its lower cost. The sprays were applied by portable mistblower to a 4-acre white pine plantation, heavily infested with white pine weevil. Four rows of trees spaced 6 x 6 feet were sprayed at one time; the spray being directed toward the leaders. Results of those tests showed that a 6-percent DDT water emulsion applied at the rate of 3 gallons per acre (1½ pounds of DDT per acre) satisfactorily controlled the white pine weevil.

Literature Cited

1. CONNOLA, D. P., T. MCINTYRE, and C. J. YOPS. 1955. White pine weevil control by aircraft spraying. Jour. Forestry 53:889-891.
2. CROSBY, D. 1958. Control of the white pine weevil with insecticidal emulsions. U. S. Forest Service, Northeastern Forest Expt. Sta. Forest Research Notes No. 78. 4 pp.
3. WATERS, W. E., T. MCINTYRE, and D. CROSBY. 1955. Loss in volume of white pine in New Hampshire caused by the white pine weevil. Jour. Forestry 53:271-274

Ponderosa Pine Seed Dissemination Into Group Clearcuttings

James D. Curtis and
Marvin W. Foiles

WHETHER a forest type is to be reproduced naturally or artificially after cutting, the occurrence of a bumper seed crop is always eventful. The forest manager must be certain that the ground where natural regeneration is to be established is suitably receptive to seedling establishment, or he must plan for collection of seed with all that it entails. He may be required to do both.

In central Idaho (including parts of the Boise, Payette, Salmon, and Sawtooth National Forests) the 1958 seed crop was extremely heavy. Conditions were apparently favorable in the summer of 1956 for the formation of many flower buds and again in the spring of 1957 for the thorough and widespread pollination of female flowers in stands ranging from open-grown, second-growth of about 50 years of age to overmature virgin forests. Production and release of pollen in late April and early May of 1957 were so prolific that pools became sulphur-colored as light gusts of wind carried clouds of pollen over thousands of acres of forest and on occasions obscured vistas momentarily. Clusters of five and seven cones were common, and one cluster of nine cones was collected. The last crop of this size and extent was produced in 1940 and resulted in widespread establishment of reproduction.

Although forests produce tremendous quantities of seed, periodicity of seed crops is rare and their frequency is generally unpredictable. This is true of ponderosa pine particularly where heavy seed crops are concerned. Forest managers must take advantage of bumper seed crops when they occur. In 1958 more than 400 acres of cutovers were scarified and 10,250 pounds of seed were collected on the four national forests previously mentioned.

The prospect of an unusually heavy seed year prompted a study consisting of several phases to determine the number of seed reaching previously clean-cut groups,[1] the subsequent number of germinates, and the eventual surviving number of seedlings per acre. This effort is centered on the Boise Basin Experimental Forest, Idaho City, Idaho, a field unit of the Intermountain Forest and Range Experiment Station.

Objective of Study

The object of investigation, the initial phase of which is described here, is to determine how many established seedlings per acre will result from the 1958 seedfall on scarified soil on the different aspects in a group selection cutting. It was therefore desirable to learn the number and viability of seeds per acre that reached these areas.

Methods

Thorough scarification and elimination of competition were achieved on 24.8 acres, with a D-7 tractor and Fleco land clearing blade. This area consisted of 31 small groups, from 0.25 to 3.0 acres in size and irregular in shape. Two or more seed trees were left on the margin of each group cutting for the specific purpose of providing seed and shade for seedlings. The number of trees and their positions were different for each group. Because of the many ravines and steep slopes, the wind currents were probably different for each area during maximum seedfall. These groups, previously composed of mature and overmature ponderosa pine, occur on slopes up to 35 percent as well as on ravine bottoms, ridges, and the four cardinal aspects.

In each of the clearcut groups, ¼-milacre traps were set out in a level position at the rate of three per acre. These rodent- and bird-proof traps were emptied at approximately weekly intervals during the period of seed flight, and the number of seed per acre computed.

When forests are established by natural means rodents and birds destroy many seeds. This loss is most serious in years of average or below average seedfall. No satisfactory way of minimizing these depredations has yet been found. To test the effectiveness of the latest rodent repellent, half of the areas were treated with ponderosa pine seed coated with a mixture of endrin and arasan and half of them with untreated seed. To learn what effect treated seed had on small rodents, five sets of treated and untreated seed were set out on one area, in known numbers in hardware cloth dishes. By checking the numbers of each taken periodically it was possible to gauge, to some extent at least, rodents' acceptance or refusal of the repellent-covered seed and the extent to which they were thus prompted to ignore the untreated seed. The preliminary check of rodent repellent measures used here suggests that the plan followed was

THE AUTHORS, research foresters, Intermountain Forest and Range Expt. Sta., Forest Service, U. S. Dept. Agric., are stationed at Ogden, Utah, and Boise Research Center, Boise, Idaho, respectively.

[1]Curtis, James D., and Alvin K. Wilson. A test of group selection in Idaho ponderosa pine. Jour. Forestry 56: 182-189. 1958.

ineffective. An additional check will be available when initial numbers of germinates on poisoned and untreated areas can be compared.

Results

The first seed was found on the ground on August 12. Maximum seedfall occurred between September 10 and 30, depending on the location, but seedfall continued throughout the winter. All traps received seed, some much more than others. Total seedfall from the 1958 cone crop averaged 245,240 ponderosa pine seeds per acre, and ranged from 123,320 to 345,080 per acre; 52 percent of the total seedfall had fallen by September 15 and 90 percent by October 22. In addition to the pine, an average of 49,720 Douglas-fir seeds per acre fell in the openings from the 1958 cone crop.

Table 1 shows seedfall for some previous years and kinds of forests, and for 1958. Obviously these data are not strictly comparable, but they provide a gauge of average numbers and, to some degree, of seed year occurrence. Because all traps in 1958 were placed in openings away from seed trees and not under them, as most traps were previously, the figures for seedfall in the group selection areas can be accepted as minima.

Seed collected from the traps yielded 90 percent sound seed, of which 83 percent proved viable in a germination test using stratified seeds. There should be, then, a substantial source of germinates as growing stock. Seed soundness percentages for the years 1936 to 1940 had been 85.4, 56.9, 61.0, 34.7, and 81.2, respectively.

The seed traps in this study were located in the group openings so as to determine the availability of seed at points judged least likely to receive it. Temperature, humidity, wind, height of seed tree, and degree of slope are factors that determine when ripened seed will be released, how far it will travel, and precisely where it will come to rest. Considering these variables, dissemination patterns from day to day (or from year to year) are unlikely to be similar, even for any one place. Actually the numbers and positions of seed trees around these openings varied and differed widely, depending on what trees were available in the uncut stand. The timber marker left trees in size, number, and location that he considered would provide good seed coverage. Very often margins of openings were made up of seedlings, saplings, or poles, or stands where the trees were too young to produce seed. In other groups it was virtually impossible to leave more than two seed trees on the entire perimeter of an opening. Because of mountain wind behavior it is possible that some marginal seed trees contributed little or no seed to a group clearcutting.

Even though the least number of seed caught in the traps was 123,320 per acre, it is impossible to learn what trees produced this seed. The timber marker must compromise in the number and location of seed trees he is able to leave, drawing on his knowledge of the species and of the area. One fact was obvious on all areas: most of the seed from a tree falls within a chain of it, but considerable seed drops in the cones and is released from them as ground heat acts on the scales. Judging from results of others[2,3] regeneration cuttings made elsewhere, under conditions similar to those outlined here, will result in seed dissemination as described above or close to it.

TABLE 1.—SEEDFALL PER ACRE FROM 1936 THROUGH 1940,[1] AND 1958

	Thousands of seed per acre					
	1936	1937	1938	1939	1940	1958
Virgin forest	173	14	10	7	254	—
Second growth	160	6	8	4	243	—
Stem selection	307	7	6	15	203	—
Group selection	—	—	—	—	—	245

[1]Intermountain Forest and Range Expt. Sta. Annual report. 1940.

The followup studies on these areas will reveal further information on the pattern of seed dispersal and the numbers of seed required for acceptable stocking on the different aspects.

Conclusions

Natural regeneration appears to be an unreliable means of regeneration in the ponderosa pine type in central Idaho, because of the infrequency and unpredictability of heavy seed crops (1934, 1940, 1958), the ubiquity of small rodents and the forest manager's inability to cope with them. It appears probable from scrutiny of the structure of ponoderosa pine forests, the known number of seed disseminated per acre in years such as 1958, the caprice of the weather, and the reproduction established from the 1940 crop (1941 was an abnormally wet season) that natural regeneration measures as such should be attempted only in years when there is to be a deluge of seed.

Because of malformation, disease, and insects, the extent of a prospective seed crop can be predicted accurately only 12 to 14 months before seedfall. This leaves, for all practical purposes, one season to plan and carry through site preparation work.

The writers believe that opportunities for the forest manager to establish the new crop by natural regeneration in central Idaho will be infrequent. His latitude for planting, however, is greater and more dependable because he can collect quantities of seed in years of good crops and can store them successfully until he needs them, thus he is assured of a steady supply of planting stock.

[2]Fowells, H. A. Some observations on the seedfall of sugar pine. U. S. Forest Service California Forest and Range Expt. Sta. Forest Res. Note 70. 3 pp. 1950.

[3]Fowells, H. A., and G. H. Schubert. Seed crops of forest trees in the pine region of California. U. S. Dept. Agric. Tech. Bul. 1150. 48 pp. Illus.

Notes & Observations

North American Forestry Commission Formed

The first session of the newly formed North American Forestry Commission, a body of the Food and Agriculture Organization of the United Nations, was held in Mexico City, July 24-29.

This Commission is the latest among six similar regional organizations through which FAO's regional program is carried out. The others are Europe, Africa, Latin America, Asia Pacific, and Near East.

The following officers were elected unanimously to serve during the inaugural session:

Chairman—Dr. Enrique Beltrán, Mexico;

1st vice chairman—Dr. J. D. B. Harrison, Canada;

2nd vice chairman—Dr. R. E. McArdle, U. S. A.;

Rapporteur—Ing. Juan Manuel González, Mexico.

The United States delegation was headed by R. E. McArdle, chief of the U. S. Forest Service, with V. L. Harper, assistant chief, as his alternate. The other members were Tom Gill, The Charles Lathrop Pack Forestry Foundation; John F. Shanklin, Department of the Interior; and James N. Diehl, U. S. Forest Service.

The delegations of Canada, Mexico, and the United States each gave brief statements broadly reviewing the areas of interest and principal forestry and forest product problems of their countries.

On the question of forest insect pests and diseases, Dr. M. L. Prebble of Canada presented a statement and emphasized the highlights of the problems from a regional and intercontinental point of view. Following thorough discussion the Commission decided:

1. To create a working group on forest insects and diseases;

2. To invite the incoming chairman of the Commission to organize this working group by requesting member governments to nominate specialists to the group, and instructing the group to select its own officers and to (a) prepare an analysis of the principal problems in the region; (b) indicate which problems are of immediate concern; and (c) suggest priorities among these problems for study and action.

OFFICERS of FAO North American Forestry Commission for current 2-year period. *L to R:* Richard E. McArdle, Chief, U. S. Forest Service, *1st vice chairman;* J. D. B. Harrison, Canadian Deputy Minister of Forestry, *chairman;* Enrique Beltrán, Sub-Secretary of Forest Resources and Wildlife, Ministry of Agriculture and Animal Husbandry of Mexico, *2nd vice chairman;* and A. L. Best, Economics Division, Canadian Department of Forestry, *rapporteur.*

Following a discussion of the subject of forest fires by J. N. Diehl of the United States, the Commission adopted the recommendation that a continuing working group be established for forest fire control and invited the incoming chairman to obtain nominations for membership of the group from the member countries. The working group is to periodically review the forest fire situation and make proposals to the Commission. Sections within the group are to review specific areas as follows: (a) forest fire prevention, (b) forest fire control technology, and (c) forest fire research.

The subject of international trade in forest products was discussed by Juan Manuel González of Mexico. The chairman suggested that the members of the Commission might wish to give further consideration to this subject and the incoming chairman was invited to explore it with members of the Commission with a view to taking such action as deemed appropriate.

Other subjects discussed included liaison between FAO and the North American Forestry Commission, technical assistance programs, and miscellaneous matters.

Canada will be host to the next session of the Commission in 1963 at a date to be later decided.

The following officers were unanimously elected for the forthcoming biennium:

Chairman—Dr. J. D. B. Harrison, Canada:

1st vice chairman—Dr. R. E. McArdle, U.S.A.;

2nd vice chairman—Dr. Enrique Beltrán, Mexico;

Rapporteur—Mr. A. L. Best, Canada.

Growth and Mortality in the Wind River Natural Area

Twelve years of observation in a 350-year-old stand of Douglas-fir (*Pseudotsuga menziesii*) on the Wind River Natural Area emphasize the impact of mortality in mature forests. Despite its advanced age, the stand is still making considerable annual growth, but a large part of this growth is being offset through mortality. Although the figures given here may not be typical of all such stands, they illustrate some of the problems con-

TABLE 1.—INVENTORY AND ANNUAL GROWTH AND MORTALITY IN THE WIND RIVER NATURAL AREA[1] (PER-ACRE BASIS)

Species	Inventory (1959)			Growth and mortality (1947-1959)					
				Cubic volume			Scribner volume		
	Trees	Cubic volume	Scribner volume	Gross growth	Mortality	Net growth	Gross growth	Mortality	Net growth
	No.	*Cu. ft.*	*Bd. ft.*	*Cu. ft.*			*Bd. ft.*		
Douglas-fir	23	9,241	63,036	26	51	−25	179	350	−171
Western hemlock	76	4,208	24,992	60	24	36	397	149	248
Pacific silver fir	38	899	4,024	11	8	3	72	31	41
Western redcedar	6	595	4,145	6	2	4	45	13	32
Western white pine	1	105	683	3	11	−8	6	71	−65
Total	144	15,048	96,880	106	96	10	699	614	85

[1]Cubic volume includes all trees 2.6 inches d.b.h. and larger for entire stem. Board-foot volume (Scribner) includes all trees 11.6 inches d.b.h. and larger to an 8-inch merchantable top.

nected with management of old-growth Douglas-fir.

Approximately 1,100 acres of old-growth Douglas-fir within the Wind River Experimental Forest was set aside by the U. S. Forest Service in 1932 as a natural area. One of seven natural areas located on national forest land in the State of Washington, the Wind River tract is located about 9 miles north of the Columbia River Gorge on the Gifford Pinchot National Forest. To measure growth and mortality, a grid of permanent sample plots was established in 1947. Growth has been measured every 6 years and mortality every 2 years. A report summarizing the first 6 years of measurement was published in 1955.[1]

Parts of the area contain an almost pure stand of Douglas-fir in which western hemlock (*Tsuga heterophylla*) and Pacific silver fir (*Abies amabilis*) are just beginning to form part of the overstory. In other places, Douglas-fir has become decadent and has been completely replaced by western hemlock and Pacific silver fir (Fig. 1). An occasional western white pine (*Pinus monticola*) and western redcedar (*Thuja plicata*) may be found scattered throughout the area. Pacific yew (*Taxus brevifolia*), vine maple (*Acer circinatum*), and Pacific dogwood (*Cornus nutallii*) compose the major proportion of the understory. Ground cover includes salal (*Gaultheria shallon*), Cascades mahonia (*Mahonia nervosa*), deerfoot vanillaleaf (*Achlys triphylla*), common beargrass (*Xerophyllum tenax*), and red whortleberry (*Vaccinium parvifolium*).

Physically, the area is typical of the western side of the Cascade Range. Topography is moderate to steep, with elevations ranging from 1,100 to 2,100 feet. Aspect is easterly and southeasterly, and the area is fairly well drained. The climate is distinctly marine, with an average annual rainfall of 89.89 inches and a mean annual temperature of 48.1° F. However, extreme temperatures and low humidities are not uncommon, and droughts of more than 2 months' duration have been recorded.[2] Site quality for the natural area averages a low III.[3]

In 1959 the stand contained 15,048 cubic feet or 96,880 board feet per acre (Table 1). Douglas-fir composed 68 percent of the board-foot volume in 1947, but gradually decreased to 65 percent by 1959. During the same period, western hemlock volume increased from 23 to 26 percent of the total stand. Pacific silver fir and western redcedar volumes have shown no change. Western white pine has all but been eliminated due to white pine blister rust, caused by the fungus *Cronartium ribicola*.

Gross growth over the entire 12

[1]Steele, Robert W., and Norman P. Worthington. Increment and mortality in a virgin Douglas-fir forest. U. S. Forest Service, Pacific Northwest Forest and Range Expt. Sta. Res. Note 110. 6 pp. Illus. 1955.

Apparent discrepancies in inventory and growth data between this 1955 report and the present report may be attributed to sampling error.

FIG. 1.—A stand in the Wind River Natural Area where overmature Douglas-fir is being replaced by western hemlock and Pacific silver fir.

[2]Steele, Robert W. Wind River climatological data 1911-1950. U. S. Forest Service, Pacific Northwest Forest and Range Expt. Sta. 21 pp. 1952.

[3]McArdle, Richard E., Walter H. Meyer, and Donald Bruce. The yield of Douglas fir in the Pacific Northwest. U. S. Dept. Agric. Tech. Bul. 201 (rev.) 74 pp. Illus. 1949.

years averaged 106 cubic feet or 699 board feet per acre per year. While Douglas-fir contributed only 26 percent of the board-foot increment, western hemlock accounted for over twice that amount, or 57 percent.

However, most of the gross growth was lost through mortality, resulting in an average net annual growth of only 10 cubic feet or 85 board feet per acre. During the 12 years from 1947 to 1959, annual mortality varied from 221 to 1,216 board feet per acre, averaging 614 board feet per acre: 57 percent occurred in Douglas-fir, 24 percent in western hemlock, 12 percent in western white pine, and 7 percent in Pacific silver fir and western redcedar.

An epidemic of bark beetles (*Dendroctonus pseudotsugae*), which reached a climax during the 1951-1953 period, took a heavy toll of Douglas-fir. Since that epidemic subsided, windthrow has been the chief cause of death in Douglas-fir. Windthrow has also caused substantial losses in western hemlock, but disease—principally dwarfmistletoe (*Arceuthobium* spp.)—has been responsible for the greatest losses in that species. White pine blister rust has been the primary cause of nearly all the western white pine mortality.

Studies in undisturbed forest stands help provide the forester with a reliable yardstick for comparing results obtained in managed stands. The data from the Wind River Natural Area also have more immediate implications. They show that annual mortality is high in old-growth Douglas-fir stands and indicate that salvage logging should be given serious consideration where final harvest will be deferred for a number of years.

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Selection of Pine Seedlings in Nursery Beds For Certain Crown Characteristics

At least two accounts[1] are found in the literature describing the selection and subsequent testing of so called "super-seedlings" from nursery beds. Progress reports on early growth comparisons of these oversized nursery bed selections indicate that in the majority of cases they have maintained their early height superiority over average or inferior seedlings several years after establishment in the field. Thus, it appears that the phenotypic selection of seedlings for inherent vigor holds some promise in a program of tree improvement. It also substantially contributes to the development of valid juvenile selection criteria for use in progeny testing at an early date.

Because the selection for vigor in nursery beds has apparently been effective in these reported cases, the authors thought it would be of interest to determine the effectiveness of selection for morphological characteristics such as crown width and limb size among nursery bed seedlings. It is recognized that a considerable and significant amount of the observed morphological variation among individual seedlings, in what is commonly referred to as uniform nursery beds, is environmental in nature. Differences in rates of seed germination, seed bed density, and minor variation in soil properties, among other things, obviously influence the phenotypic expression of seedling growth and form. For these reasons, the seedlings used in this study were all oversized in development and extended well above the mean level of neighboring seedlings. Seedlings such as these definitely possessed unrestricted crown space, and, theoretically, environmental advantages for the early expression of crown differences.

Eighty loblolly pine (*Pinus taeda* L.) seedlings were initially selected for conformity to each of the following artificial crown width classes: (1) seedlings without or with extremely short and fine lateral branches, (2) seedlings with average or apparently normal sized lateral branches, and (3) seedlings with exceptionally long and coarse lateral branches. For ease in classification these are hereafter referred to as (1) narrow, (2) medium, and (3) wide crown classes, respectively.

After initial measurements, the seedlings were outplanted by crown width classes, in 20-plant rows, with 4 replications. They were planted at a 6 × 8 foot spacing on an especially prepared, disked, site. The measurements recorded for each plant were: (1) total height, (2) stem diameter at ground line, (3) length of longest branch, (4) diameter of longest branch, and (5) diameter of bole subjacent to the measured branch. The same measurements were made 12 months later on each seedling in the field. It should be noted that the longest lateral branch, in the most prominent whorl, was measured in both instances regardless of its relative position on the individual plant. Hence the initial and final measurements of branch size are not necessarily restricted to the same branch. This discrepancy results from the fact that the largest branches in 1-0 seedlings usually occur at the distal end of the first or second growth flush, although the seedlings used in this study made a total of 3 or even 4 growth flushes while in the nursery bed. By the end of the second growing season the most prominent whorl and largest branches had, in many seedlings, shifted upward to the distal end of the first season's growth; hence it seemed pertinent and appropriate to measure the largest branch wherever it occurred on the individual plant. The mean initial and final measurement data are given in Table 1.

Some idea of the relationships

[1]Ellertsen, Birger W. Selection of pine super-seedlings—an exploratory study. Forest Sci. 1:111-114. 1955.

Zobel, B. J., F. C. Cech, and R. E. Goddard. Outstanding nursery seedlings—a progress report. Tex. Forest Serv., Res. Note 18. 14 pp. 1957.

TABLE 1.—SUMMARY OF MEASUREMENTS OF LOBLOLLY PINE SEEDLINGS SELECTED FOR CERTAIN CROWN CHARACTERISTICS

	Crown Width Class					
	Narrow		Medium		Wide	
	1-0	1-1	1-0	1-1	1-0	1-1
	Total Height (Cm)					
Rep I	46.9	67.8	49.9	69.3	48.7	73.2
II	48.0	72.6	46.8	69.9	47.0	68.5
III	44.0	63.4	48.6	71.1	46.0	67.2
IV	45.8	79.3	44.9	82.5	51.5	75.1
All Reps	46.6	70.8	47.1	73.8	48.1	71.0
	Stem Diameter at Ground Line (Cm)					
Rep I	.71	1.16	.74	1.32	.82	1.32
II	.79	1.26	.79	1.36	.79	1.33
III	.60	.90	.74	1.27	.85	1.22
IV	.68	1.12	.78	1.52	.82	1.45
All Reps	.70	1.15	.77	1.38	.82	1.33
	Length of Lateral Branches (Cm)					
Rep I	1.4[1]	19.8[2]	4.9	22.1	9.5	20.5
II	1.4	24.0	5.7	22.6	12.4	23.6
III	1.6	16.6	5.2	20.9	9.1	23.2
IV	2.1	21.7	5.2	23.8	10.2	24.0
All Reps	1.6	20.7	5.3	22.5	10.2	22.5
	Diameter of Lateral Branches (Cm)					
Rep I	.44[1]	.77[2]	.44	.86	.56	.84
II	.48	.80	.44	.76	.49	.90
III	.36	.48	.48	.77	.48	.83
IV	.42	.80	.44	.88	.50	.80
All Reps	.43	.74	.45	.82	.51	.85
	Bole Diameter Subjacent to Measured Branch (Cm)					
Rep I	.44	.77	.44	.86	.56	.84
II	.48	.80	.44	.76	.49	.90
III	.36	.48	.48	.77	.48	.83
IV	.42	.80	.44	.88	.50	.80
All Reps	.48	.74	.45	.82	.51	.85

[1]Seedlings lacking branches at this measurement not included.
[2]Mean of all seedlings at this measurement.

between the three crown width classes can be gained from the means presented in Table 1. Initially, seedling height and diameter showed a slight positive association with crown width. These trends were no longer evident after one year in the field, although mean diameter of the narrow crown selections was less than that of the other two classes. There is no real evidence in the height and diameter performance of the seedlings that would suggest substantial differences in general vigor between crown classes.

The most striking result obtained from this study is the complete erasure of the pronounced initial differences in branch length and diameter among the three crown classes by the end of the first growing season. The failure of these differences to be maintained was also confirmed by analyses of variance for final branch length and diameter. Had the selection been of value in recognizing trees that would retain a narrow-crowned habit, it is expected that these trees would have maintained at least a statistically identifiable portion of their original differences after one year in the field.

In view of the uniformity that was observed, it is unlikely that there is any value in selecting for narrowness of crown or fineness of limbs in 1-0 loblolly pine seedlings in nursery beds of unknown parentage.

The results of this study should not be interpreted to mean that selection for narrowness of crown or small branch diameters would not be effective among progeny groups from selected parents at a very early age. In fact, it is known that distinct differences in crown widths do appear in slash pine (*Pinus elliottii* Engelm.) at an early age in 1-parent progeny tests of selected parents as demonstrated by Barber et al.[2] Whether these differences could be validly detected in first year seedlings is questionable, hence it is obvious that more detailed studies are needed on the correlation of juvenile and mature characteristics with progeny from selected parents. This is especially true if, in the not too distant future, the nurseryman is to take full advantage of screening or grading myriads of genetically improved seedlings from known parentage.

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[2]Barber, John C., Keith W. Dorman, and R. Aaron Jordan. Research Note No. 86. U. S. Forest Service, Southeastern Forest Expt. Sta. Asheville, N. C.

Photomicrographs by Direct Projection[1]

Research workers in specialized fields of forestry often need photographs of microscopic structures to illustrate findings for publication. The preparation of photomicrographs is a painstaking and time consuming process. Assembling the necessary equipment, determination of light intensity, selection of usable slides, and the actual photographing are only part of the job. Film or plates must be developed, fixed, washed, and dried before printing.

A simple method to supplement the usual procedure for preparing photomicrographs is to use a microscope as a photographic enlarger and project the slide image directly to print paper. Although the projecting microscope has had wide usage in schools and research institutions, the adaptation of this piece of equipment as a photographic enlarger is not widely known.

The procedure for the preparation of direct projections is simple. After choosing a slide, it is inserted in the projecting microscope and the image is focused on a standard enlarger easel. The room is darkened except for safe lights. A sheet of photographic print paper is placed in the easel, the projector switch is snapped on momentarily, and the paper is then developed.

[1]This work was done in cooperation with the Georgia Forest Research Council and the College Experiment Station, University of Georgia, Athens.

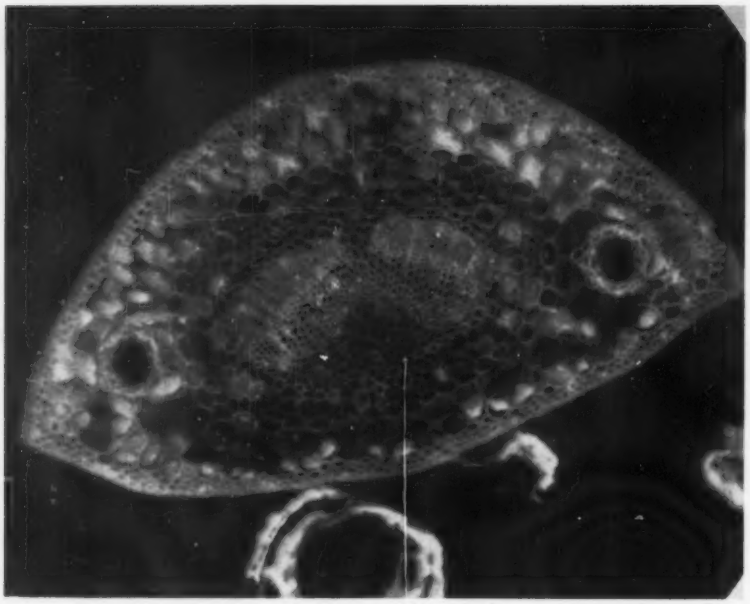

FIG. 1.—Cross section of a pine needle projected directly on print paper using a projecting microscope.

The resulting print is a negative of the projected image, but this is of little consequence if the desired contrast of minute structures is obtained (Fig. 1).

Both contact and enlarger papers may be used. Contact papers require more light for exposure and may be used if the image is particularly bright and clear, or if the image is concentrated on a small area. On larger projections or when the image is obscure, enlarger paper works well. High contrast papers, numbers 4 and 5, are best for most work. Prints obtained by this method have been used in a publication.

The procedure can be modified by using a timer to cut the projector on and off in the same manner as a photographic enlarger. Test strips cut from papers of various degrees of contrast will help in choosing the proper exposure time and the desired contrast. Filters aid in controlling light intensity. Direct positive papers are manufactured by several companies and may be suitable for obtaining positive prints.

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Computation of Height Growth on Continuous Forest Inventory Plots

Continuous Forest Inventory is characteristically a system of permanent plots upon which individual tree records are maintained for the purpose of securing representative forest management information. Volume and growth of these trees are determined from repeated measurements of diameter and height and their computation from standard volume tables or formulas. Emphasis is placed upon accurate and consistent results. While diameter can be directly measured with these results, height measurements are not as precise and are subject to personal errors. With many short-bodied trees, merchantable height can be measured accurately by the use of a calibrated pole. As the trees increase in height or where total height is obtained, less accurate methods must be relied upon. Personal judgment in these methods can greatly affect both volume and growth determinations.

It is the purpose of these notes to review and compare several methods that have been used in C.F.I. work. For the purpose of comparison, Table 3, entitled "Composite Tables: Gross Peeled Volume in Cubic Feet, Entire Stem, by Total Height," by Gevorkiantz and Olsen[1] will be used. This table can be expressed by the formula:

$V = 0.42\ BH$

V = the peeled cubic foot volume
B = the basal area in square feet computed from the diameter outside bark at breast height
H = the tree's total height in feet

The first method that has been used involves the curving of height over diameter for selected trees and the construction of a local volume table which is applied to the measurements for the beginning and the end of the growth period. Assuming this curve of total height over diameter to be:

$$H = 101 - \frac{288}{D}$$

D = the diameter outside bark at breast height

Then, any tree 10 inches in diameter will be given a height of 72 feet and a subsequent volume of 16.5 cubic feet. If the diameter has increased to 11 inches at the end of the growth period, a height of 75 feet will be assumed and the subsequent volume of 20.8 cubic feet will result in a growth of 4.3 cubic feet. This will be the case whether the original height of this tree was actually 72 feet or was 50 feet or even 90 feet. The chief difficulty of this method is that the tall and short-bodied trees are assumed to have the same height. This commonly results in underestimating the volume of densely stocked plots and an overestimation on lightly stocked plots.

For this reason, many C.F.I. users have required separate height determinations for each tree. Since heights are determined independently at the beginning and end of each growth period, a distinction is made in the volume and growth computed for trees of different heights. Continuing with the above example, a 10-inch tree 50 feet in height will have a volume of 11.4 cubic feet, while a volume of 20.6 cubic feet will be computed for a

[1]Gevorkiantz, S. R., and L. P. Olsen. Composite volume tables for timber and their application in the Lake States. Tech. Bul. No. 1104. U. S. Department of Agriculture. Washington, D. C. 1955.

tree 90 feet in height. If no change in the height is detected during the growth period, these trees when reaching a diameter of 11 inches will have volumes of 13.9 and 24.9 cubic feet for a growth of 2.5 and 4.3 cubic feet, respectively. From an inspection of the volume formula, it appears that this growth will be increased or decreased 0.28 cubic feet for each foot of height growth. Since an increase of 0.1 inch in diameter would result in an increase of 0.35 cubic feet, a change of 5 feet in height at the second measurement will have the same effect upon volume that a 0.4 inch change in diameter would have. Errors of a few feet in height arising from personal judgment, can completely confound the growth figures obtained on individual trees.

A better solution than either of the above methods would be to combine the more accurate tree volume based upon individual tree height, with an unbiased estimate of height growth, such as is allowed for in the local volume table. This could be accomplished by reading the height growth directly from the curve of height over diameter and adding this growth to the actual height of the individual tree to compute volume growth. An objection might be made that short-bodied trees will show less height growth per inch of diameter increase than tall-bodied trees. It is more reasonable to assume that a tree will maintain the same ratio of individual height to curved height during the growth period. Using this method, the 50-foot tree would be computed to increase to 52 feet in height and from 11.4 to 14.4 cubic feet for a growth of 3.0 cubic feet. The 90-foot tree would be computed to increase to 93 feet and from 20.6 to 25.7 cubic feet for a growth of 5.1 cubic feet. This relation can be written in equation form for machine calculation as follows:

$$\frac{H_1}{H_2} = \frac{h_1}{h_2}$$

H_1 = original total height in feet
H_2 = computed total height at end of growth period
h_1 = curved total height for original diameter
h_2 = curved total height for diameter at end of growth period.

Therefore, the formula for individual tree growth can be written as follows:

$$V_2 - V_1 = 0.42 \left[B_2 \left(\frac{h_2}{h_1} \times H_1 \right) - B_1 H_1 \right]$$

V_1 = original cubic foot volume
V_2 = cubic foot volume at end of growth period
B_1 = original basal area
B_2 = basal area at end of the growth period

The assumption that an individual tree will maintain its past superiority or inferiority in height growth as compared with an average curve, is also made in constructing a family of site index curves. The use of this assumption allows accurate volume computations for individual trees, while providing an unbiased estimate of height and volume growth.

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Characteristics of Good and Poor Managers of Small Woodlands is a very interesting four-page leaflet issued as Research Summary No. 73 by the Federal Extension Service, USDA. Prepared by Fred P. Frutchey, the summary pinpoints the characteristics of small woodland owners from eight source studies.

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Book Reviews

William B. Greeley—A Practical Forester

By George T. Morgan, Jr. 82 pp. Forest History Society, St. Paul 16, Minn. 1961. $2.95.

This is a fine little book about a fine big man. Morgan has done an excellent job of tracing Colonel Greeley's career in the U. S. Forest Service from 1904 to 1928. Even though the limitation is clearly and promptly stated that the book deals only with the public service phase of Greeley's life, perhaps it might have been emphasized in the title; because the practical forestry of Bill Greeley continued until his death in 1955.

Having been privileged to know the Colonel well, I read this biography with a good deal more than casual interest. It is well done, there is evidence of much scholarly research, copious footnotes, and references. From this prodigious array of information Morgan has extracted an accurate portrayal. He shows Greeley's early evangelical zeal for the forest, his sense of responsibility for resource stewardship, his ability to understand the other man's problems and to appreciate his possibilities for solution of those problems. This facet of the Colonel's character is particularly well illustrated in the recital of his differences with Pinchot.

The thing which Morgan has done best is to show Colonel Greeley as the great cooperator. It was always his intent to achieve desirable goals through willing cooperation rather than reluctant or forced acquiescence. Greeley's prodigious effort on behalf of the Clarke-McNary Bill was a natural outgrowth of his belief that industry and state and federal governments could work together to achieve desirable goals in forestry.

It is customary for reviewers to complain about something, but it is difficult to do so in this case. The few errors are flyspecks. One legitimate regret is that the story is so short. Granted, it is difficult to illumine the text with anecdotes when the principal character is not available to supply them; but a few more of the many stories of and by Colonel Bill would have added a personal warmth and a larger dimension to the recital. As it stands this is a sound description of part of the career of a great man. I could wish the story had been longer to do him full justice. This is a good beginning. Now we need the rest of Colonel Greeley's career.

W. F. McCulloch
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Forestry College—1911-1961

Edited by George R. Armstrong. viii+360 pp. Illus. The Alumni Association, State University College of Forestry at Syracuse University, Syracuse 10, N. Y. 1961. $8.30.

Your reviewer entered upon his study of this book in somewhat of a nostalgic mood, simply because he received a degree from the New York State College of Forestry at Syracuse University (now State University College of Forestry at Syracuse University) during the second decade of its existence—1924 to be exact. A quick riffling of the pages to note the format and the pictures disclosed the long arm of coincidence.

On page 144 is a group picture of those foresters who played on the lacrosse team which in 1923 journeyed to England and won the World's Lacrosse Championship. The caption identifies the nonplayer as lacrosse coach Laurie Cox. Unfortunately, this is not true. The gentleman is your reviewer who at that time was assistant manager of lacrosse. Dr. Cox may not appreciate this misidentification.

This is a book which will invoke happy memories on the part of some, but more important it is a book that accurately portrays the

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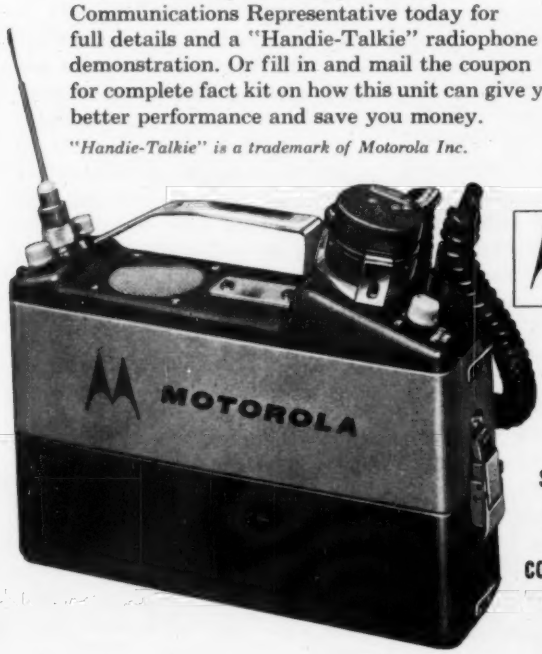

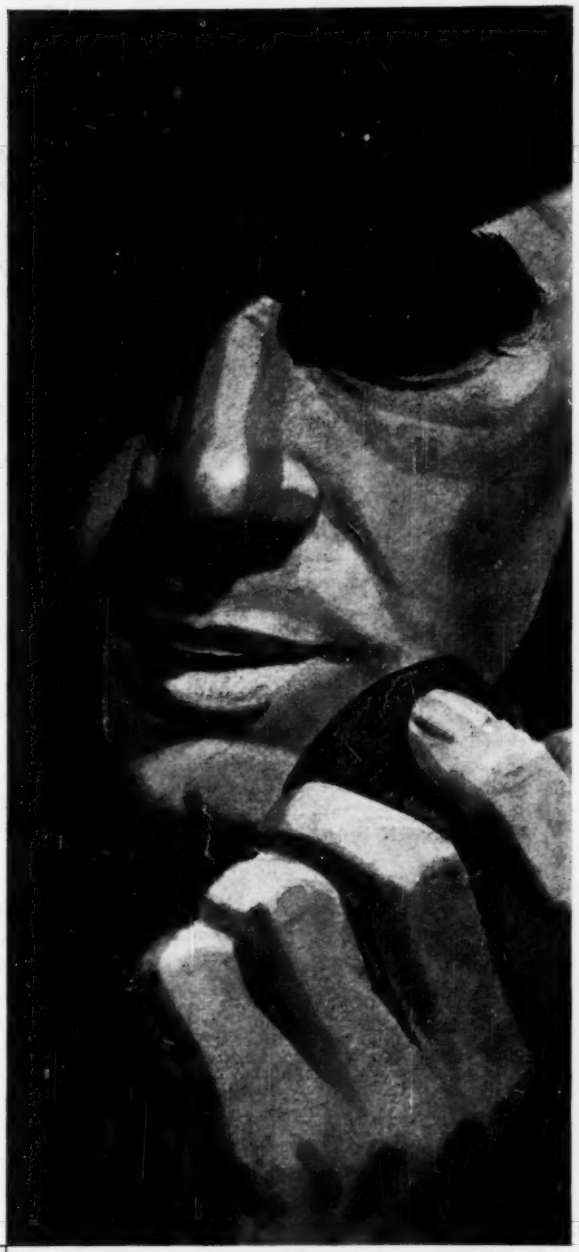

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progress in forestry education these past 50 years. Its subtitle is "Essays on the Growth and Development of New York State's College of Forestry." The 15 essays by 15 different authors are divided into four major parts.

Part One entitled "The Pageant" reviews the vicissitudes relative to the initiation of forestry education in this country and especially within the State of New York. It treats with the early difficulties of financing the construction of a physical plant for forestry education together with the gradual acquisition of full physical facilities, of topnotch faculty members, and of perfecting a truly good working relationship with Syracuse University and with the State University of New York of which the College of Forestry is now an integral part.

Part Two entitled "The People" is devoted to those people who were responsible for the early progress made by the College such as members of the Board of Trustees, the original faculty members, and especially the deans of the College. It also deals very precisely with the assistance Syracuse University provided this College in its formative stages and throughout the entire 50 years. It discusses specifically the assistance afforded by the various chancellors of the University who played such prominent parts in the early history of the College. A chapter is included on student affairs and another on alumni activities.

Part Three entitled "The Program" treats with the early divisions of the educational curriculum and the way in which the College has changed its program from time to time to meet the changing educational needs of foresters of the nation. This is a particularly revealing section as it deals with the heart of the College—its program of education for undergraduates, for graduates, for research students, for the general public, and for its ranger school, of which there are only two in the nation. There is an interesting discussion of the ancient and constantly recurring struggle in the professional educational world to strike the right balance between technical specialization and the humanities which has left its mark on the College curriculum. The general trend toward more emphasis on graduate studies, research activities and public education is vividly outlined.

Part Four entitled "The Prospects" is the only part not devoted to the past. This part, written by Dean Hardy L. Shirley, takes a long look ahead into the future. On the basis of the past 50 years, Dr. Shirley seeks to project the future needs that will confront this College in the fields of world forestry, national forestry, and New York State forestry. Dr. Shirley sums up the prospects for the future in two parts: Quality of faculty and the urge for achievement. On the basis of the quality of its faculty and its achievements during its first 50 years, the future of the College of Forestry looks very bright indeed.

JOHN F. SHANKLIN
Department of the Interior, Washington, D. C.

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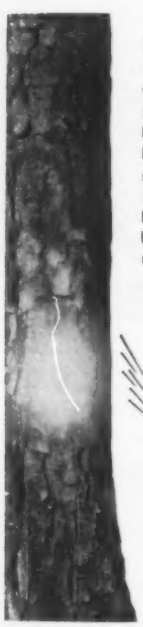

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Your Future in Forestry

By David H. Hanaburgh. 159 pp. Richards Rosen Press, New York. 1961. $2.95.

Hanaburgh is a consulting forester with varied experience in the Northeast and South. He writes with authority gained from holding positions of responsibility and discusses his profession in a frank, realistic, comprehensive manner.

Enthusiastic about his work, the author says, "There are unusual opportunities for individual initiative and self-expression in the forestry profession. The nature of forestry work is such that a forester is his own boss much of the time. He is expected to produce results, but how the results are produced is left largely to him. Since there is no pat formula or process for the solution of many problems that face him in his daily work, he must exercise his imagination and sound judgment to arrive at a sensible solution."

By way of introduction he describes the careers and professional development of several prominent foresters with whom many of us are acquainted.

A young man is advised, first of all, to choose a line of work he thinks he can enjoy, one in which he can become so interested that he will forget long hours and inconveniences. Attributes which make for a successful career and

the satisfactions and disadvantages of forestry work are described. The latter include instability of location, living conditions, and some of the physical annoyances of woods work. High school preparation for entering college is discussed and the facilities at each of the collegiate institutions offering forestry accredited by the SAF are listed.

A description of technical fields of forestry along functional lines presents a clear and generally accurate picture. His emphasis and perspective on timber production, water conservation, and the growing roles of recreation and public relations are in balance. The duties and increasing responsibilities a forester might experience as an employee of one of several public agencies, in industrial employment, teaching, research, and consulting work are covered. Many kinds of self-employment are described for which forestry training is excellent preparation. This treatment results in substantial repetition, but it does serve to review material which the author possibly wishes to emphasize to young readers.

Chapters of special interest to prospective students concern financial aids to education and sources of information on forestry. A self-evaluation test consisting of multiple-choice questions is provided with answer sheet. The design of the test needs refinement and I doubt that it can give appreciable insight to a prospective student's attitude or suitability for a forestry career. It may, as the author suggests, make him think about what he is getting into if he takes up forestry.

One chapter concerned with preparing a summary of personal data on background, qualifications, and experience for prospective employers, though out of place in a book concerned with choosing a career, should be read by senior forestry students and graduate foresters who plan to apply for a job.

As a forester you may dispute an occasional definition or description. Some details are outdated such as reference to "junior forester" as the entering position in the Forest Service and forest pathology work in the Bureau of Plant Industry, Soils and Agricultural Engineering, and forest entomology in the Bureau of Entomology and Plant Quarantine.

A career book can be extremely valuable reading for a young man in search of a life's work. He usually is unable to learn all he needs to know from contact with one or two forester acquaintances whose job experience may be specialized or limited. Through reading he will be in better position to ask intelligent questions of those from whom he seeks advice.

Recommended reading for your young friends who contemplate a forestry career.

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A Manual of Common Beetles of Eastern North America.

By Elizabeth S. and Lawrence S. Dillon. 884 pp. Illus. Row Peterson and Company, Evanston, Ill., and Elmsford, N. Y. $9.25.

An attempt has been made to include in this extensive work the more common and more colorful species of beetles in eastern North America, or those most apt to come to the collector's attention. This impressive manual treats of some 1,200 of the estimated 10,000 species.

The introductory section describes methods of collecting, killing, and preserving beetles and preparing them for collections and study. It also contains a brief section on beetle larvae and a chapter on the ecology of North American beetles.

Standard keys serve to separate the 64 families included in the manual. These are amply interspersed with illustrations of structural characters, as are the keys to genera and species.

The book contains 81 plates of black and white drawings of species treated and 4 color plates of the more striking species.

In the author's words, "This book is intended for anyone interested in North American beetles—the casual naturalist, the amateur collector, the serious student, and the professional. . . ." It will no doubt be most useful to the first two groups mentioned. Since it includes only 12 percent of the estimated number of beetles occurring in eastern North America the latter two groups would therefore be expected to find it less useful. For example, the forester or the forest entomologist will seek in vain under Scolytidae for mention of such well known forest beetles as *Dendroctonus terebrans, D. piceaperda, Ips avulsus,* and many others. Similar omissions occur under other important families containing forest beetles.

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Forest Service, U. S. Dept. Agric., Washington, D. C.

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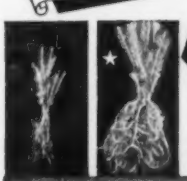

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Current Literature

Compiled by LOIS MCALLISTER, *Assistant Librarian, State University College of Forestry at Syracuse University*
Range Management Section Compiled by NELLIE G. LARSON, *Library, U. S. Department of Agriculture*

General

Bibliography of Engelmann Spruce and Subalpine Fir. By Frank Ronco. 58 pp. Rocky Mountain Forest and Range Expt. Sta., Fort Collins, Colo. 1961. Sta. Paper No. 57.

Highlights in the History of Forest Conservation. Rev. 30 pp. U. S. Department of Agriculture, Washington 25, D. C. 1961. Agric. Information Bul. No. 83. 15 cents (Govt. Print. Off.).

Third Report on Forestry Progress in Liberia 1951-1959. By Torkel Holsoe. 49, [29] pp. Illus. International Cooperation Administration, Washington 25, D. C. 1961.

Timber, America's Magic Resource. By M. C. Elmer. 208 pp. Illus. Christopher Pub. House, Boston, Mass. 1961. $4.

Farm Forestry

Farmer Marketing of Timber in Eight Southeastern Ohio Counties. By M. S. Turner and G. H. Mitchell. 23 pp. Ohio Agric. Expt. Sta., Wooster. 1960. A.E. No. 316.

Ten-Year Earnings from Two Small Woodlands. By W. C. Mitchell and H. H. Webster. 31 pp. Illus. Northeastern Forest Expt. Sta., Upper Darby, Pa. 1961. Sta. Paper No. 145.

Forest Genetics

Measuring Branch Characters of Longleaf Pines. By E. B. Snyder. 4 pp. Tables, chart. Southern Forest Expt. Sta., New Orleans, La. 1961. Occasional Paper No. 184.

Northeastern Forest Tree Improvement Conference, 8th, New Haven, Conn., Aug. 18-19, 1960. Proceedings. Ed. by E. J. Schreiner. 57 pp. Illus. Northeastern Forest Expt. Sta., Upper Darby, Pa. 1961.

Rooting Greenwood Cuttings of Sugar Maple; Effect of Clone and Medium. By W. J. Gabriel, J. W. Marvin, and F. H. Taylor. 14 pp. Illus. Northeastern Forest Expt. Sta., Upper Darby, Pa. 1961. Sta. Paper No. 144.

Forest Influences

Economics of Watershed Planning: Proceedings of the Symposium . . . at Knoxville, Tenn., June, 1959. Ed. by G. S. Tolley and F. E. Riggs. 339 pp. Maps, tables. Iowa State University Press, Ames. 1961. $3.95.

Glaze Damage in Forest Stands in Southeastern Manitoba. By J. H. Cayford and R. A. Haig. 16 pp. Illus. Canada Dept. of Forestry, Forest Research Branch, Ottawa. 1961. Tech. Note No. 102.

Forest Management

Roadside Brush Control with 2,4,5-T on Eastern National Forests. By W. E. McQuilkin and L. R. Strickenberg. 24 pp. Illus. Northeastern Forest Expt. Sta., Upper Darby, Pa. 1961. Sta. Paper No. 148.

Wells-Pullen Forest Management Demonstration; the First Ten Years. 5 pp. Illus. Georgia Forestry Commission. Rome, and Tennessee Valley Authority, Norris. 1961.

Yield of Unmanaged Slash Pine Stands in South Florida. By O. G. Langdon. 13 pp. Charts, tables. Southeastern Forest Expt. Sta., Asheville, N. C. 1961. Sta. Paper No. 123.

Forest Products

Bark Chemicals from Shasta Red Fir as Stiffening Agents for Corrugating Medium. 14 pp. Tables. Oregon Forest Research Center, Corvallis. 1961. Report No. C-5.

The Lychee in Florida. Rev. By Milton Cobin. 35 pp. Illus. University of Florida, Agric. Extension Serv., Gainesville. 1961. Bul. No. 176.

Logging and Milling

Effect of Tree Size of Jack Pine on Harvesting and Conversion to Lumber in Northern Ontario. By J. A. Doyle and W. W. Calvert. 26 pp. Illus. Canada Dept. of Forestry, Forest Products Research Branch, Ottawa. 1961. Tech. Note No. 19.

Forced Air-Drying of Southern Pine Lumber. By L. I. Gaby. 20 pp. Illus. Southeastern Forest Expt. Sta., Asheville, N. C. 1961. Sta. Paper No. 121.

Lumber Grade and Value Performance of Young-Growth Ponderosa Pine Logs at the Challenge Experimental Forest. By C. A. Newport and E. L. Amidon. 14 pp. Charts, tables. Pacific Southwest Forest and Range Expt. Sta., Berkeley, Calif. 1961. Tech. Paper No. 55.

Pathology

Control of Black Root Rot of Pine Seedlings by Soil Fumigation in the Nursery. By A. A. Foster. 5 pp. Illus. Georgia Forest Research Council, Macon. 1961. Report No. 8.

"Fomes annosus"; What It Is and How to Recognize It. By P. V. Mook and H. G. Eno. 33 pp. Illus. Northeastern Forest Expt. Sta., Upper Darby, Pa. 1961. Sta. Paper No. 146.

The Mistletoes; a Literature Review. By L. S. Gill and F. G. Hawksworth. 87 pp. U. S. Department of Agriculture, Washington 25, D. C. 1961. Tech. Bul. No. 1242. 35 cents (Govt. Print Off.).

Protection

Firefighting Chemicals — New Weapons for the Fire Suppression Crew. By J. B. Davis, D. L. Dibble, and C. B. Phillips. 27 pp. Illus. Pacific Southwest Forest and Range Expt. Sta., Berkeley Calif. 1961. Misc. Paper No. 57.

Range Management

Economics of Meadow Improvement in Northern Nevada. By G. D. Fulche 23 pp. Illus. Nevada Agric. Expt. Sta., Reno. Dec. 1960. Bul. No. 215.

Frost Features and Vegetation Types in the Wyoming Alpine Zone. By P. L. Johnson. 3 pp. Wyoming Agric. Expt Sta., Laramie. June 1961. Wyoming Range Mangt. No. 151.

Grazing Management Pays on Perennial Grass Range During Drought. By L. Rader. 2 pp. Pacific Southwest Forest and Range Expt. Sta., Berkeley, Calif. Apr. 1961. Res. Note No. 179.

1960-61 Progress Report. Range Management Research. 22 pp. Nevada Agric. Expt. Sta., Reno. Mar. 1961. Circ. No. 33.

Notes on Some Rooting Characteristics of Antelope Bitterbrush. By B. R. McConnell. 5 pp. Pacific Northwest Forest and Range Expt. Sta., Portland, Ore. Apr. 1961. Res. Note No. 204.

Vegetation and Soil Condition Changes on a Subalpine Grassland in Eastern Oregon. By G. S. Strickler. 46 pp. Illus. Pacific Northwest Forest and Range Expt. Sta., Portland, Ore. May 1961. Res. Paper No. 40.

Silviculture

Analysis of Five Years Dendrometer Data Obtained within Three Deciduous Forest Communities of Neotoma. By R. L. Phipps. 34 pp. Illus. Ohio Agric. Expt. Sta., Wooster. 1961. Research Cir. No. 105. (The Neotoma Ecological and Bioclimatic Lab. Spec. Report No. 3.)

Effect of Seedbed Condition on Regeneration of Virginia Pine after Logging. By E. T. Sucoff. 10 pp. Illus. Northeastern Forest Expt. Sta., Upper Darby, Pa. 1961. Sta. Paper No. 147.

Growth and Quality of Pruned Black Walnut. By F. B. Clark and K. W. Seidel. 11 pp. Illus. Central States Forest Expt. Sta., Columbus, Ohio. 1961. Tech. Paper No. 180.

A Preliminary Report Concerning Radial Growth of Selected Trees at Neotoma. By R. L. Phipps and G. E. Gilbert. 44 pp. Tables. Ohio Agric. Expt. Sta., Wooster. 1961. Research Cir. No. 102. (The Neotoma Ecological and Bioclimatic Lab. Spec. Report No. 2.)

Wood Technology

Circular Slide Rule for Calculating Wood Moisture Content. By M. A. Taras. 6 pp. Illus. Southeastern Forest Expt. Sta., Asheville, N. C. 1961. Sta. Paper No. 125.

Shrinkage and Density of Australian and Other Woods. By R. S. T. Kingston and C. J. E. Risdon. 65 pp. Tables. Commonwealth Scient. and Indust. Research Org., Melbourne, Australia. 1961. Div. of Forest Products. Technological Paper No. 13.

Society Affairs

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1960-1961

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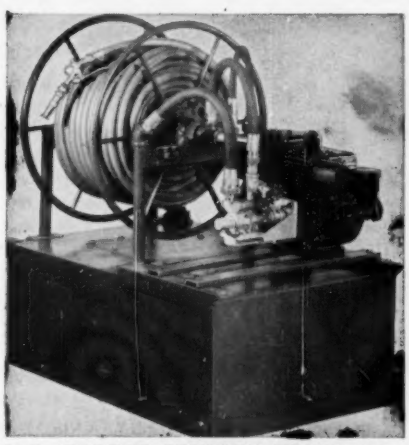

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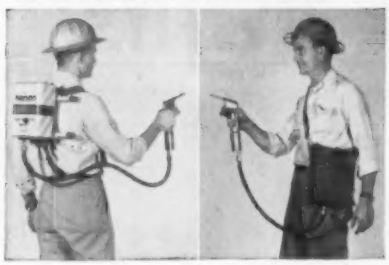

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Council's Column

A Managed Forest Can Be a Thing of Beauty and a Joy Forever

Gaining public acceptance of this title cuts to the core of American forest policy and need.

Despite our frontier heritage of making farms out of forests, the public has a deeply rooted idea that there is something somehow undesirable about cutting down trees, though they happily use a thousand products made from them. The "woodman, spare that tree" concept developed over a long time and was greatly strengthened during the "cut out and get out" era. "Selective cutting" which followed, was, from a public relations standpoint, a half-hearted attempt to regain respectability. Currently, an antipathy to timber cutting is liberally nurtured by a flood of recreation, nature, and wilderness writings.

There is a curious dichotomy in public attitudes between what people think or can be led to think ideologically, and what they will accept in practice. People tend to accept what they find. Michigan's forests, for example, are enjoyed by increasing millions. They are young forests of many kinds that naturally developed or were planted after logging and fire. The people visiting them don't seem to object; they like aspen stands, plantations, and thrill to the fall coloration of sprout hardwood stands growing over old stumps. These varied stands are what are there, and people continue to flock north.

At the same time, at least some of these forest users, joined by many others one suspects of being rather removed from forest reality, support various organizations that decry the desecration of the forests, the tree cutters, and foresters by implication. This split does not seem strong in Europe. People there love nature and enjoy their forests. They find and accept these pleasures in forests managed mainly for timber production.

The cold fact of the matter is that, with mounting population, we are going to have to accept managed forests in this country too. There is not enough forest land for everything and everybody. Present emphasis on multiple use reflects this. But it is a term that can mean different things to different people. At the present time, its application is largely in the direction of modifying or restricting timber use to meet sharply increasing recreation, wildlife, and other land use demands. Much of this can and needs be done.

There comes, however, a point where timber uses, which are of major economic concern, have to be met too. An area of present and potential tension is in roadside strips, zones around recreation areas, and the like that gradate out into forest areas generally. Much of what is done to favor recreation and wildlife is done by modifying cutting practice at the expense, rather literally, of timber use, the major measurable dollar producer.

There can be a trap concealed in zealous advocacy of multiple use unless it is accompanied by understanding of its true nature. Let us say, for example, that I am an unabashed devotee of the wilderness (a very relative term) or of recreation. By dint of much clamor, areas have been set aside or cutting restrictions made that satisfy me. I'm all for multiple use because it provides what I want. But suppose equal clamor arises to intensify timber production that in part, at least, reverses this direction. Now, I am against multiple use because it is not giving me what I want and voice my plaint accordingly. People must be educated and conditioned to understand and accept the dynamic integrative, give-and-take compromise nature of multiple use. Until this is accomplished, multiple use rests on an unstable basis. It is a course that takes much courage and requires difficult decisions.

A positive approach toward timber production as a major part of total land use must be maintained. The Weyerhaeuser Company provides an outstanding example. There should be no apology, implied or otherwise, for harvesting trees and maintaining young and vigorous forests that produce useful products. We need to understand and get used to them; they offer major opportunities for recreation and other nontimber uses. Cutting must be done with an eye for esthetics as well as utility, and many adjustments and modifications should be wholeheartedly made. Foresters must take leadership not only in recognizing public desires but also in shaping them to meet realities.

Only by so doing can the challenge be met, as so ably emphasized by President Connaughton, of convincing the public that foresters are indeed responsible stewards of forest lands. As a large part of this, people in general need better to see the beauty there is in well-managed forests.

KENNETH P. DAVIS

The Biennial Elections

On September 16 nominations closed for the biennial election of SAF president, members of the Council, and the grade of Fellow. The following is the complete and final list of nominations. The election will be held on December 2, by which date ballots, to be mailed this month, must be returned.

For President

B. E. Allen, Savannah, Ga. (Council Member 1956-1957, 1958-1959, 1960-1961.)

Paul M. Dunn, New York, N. Y. (Council Member 1946-1947, 1948-1949.)

J. Herbert Stone, Portland, Ore. (Council Member 1954-1955, 1956-1957, 1958-1959.)

For the Council

John A. Beale, Madison, Wis.

William C. Bramble, Lafayette, Ind. (Council Member 1960-1961.)

Milton M. Bryan, Washington, D. C.

Gene L. Butcher, Frankfort, Ky.

Donald E. Clark, Denver, Colo. (Council Member 1958-1959, 1960-1961.)

Robert H. Clark, Fordyce, Ark.

F. T. Frederickson, International Falls, Minn.

W. D. Hagenstein, Portland, Ore. (Council Member 1958-1959, 1960-1961.)

Svend O. Heiberg, Syracuse, N. Y. (Council Member 1960-1961.)

George M. Jemison, Washington, D. C.

Dahl J. Kirkpatrick, Albuquerque, N. Mex.

Carl G. Krueger, Coeur d'Alene, Idaho.

Charles H. Lewis, Jr., Alexandria, La.

Walter H. Lund. Portland, Ore.

William A. Parr, Bel Air, Md.

Archie E. Patterson, Athens, Ga.

Burnett H. Payne, Washington, D. C.

Richard J. Preston, Jr., Raleigh, N.C. (Council Member 1960-1961.)

James G. Rowbury, Philadelphia, Pa.

Kenneth J. Seigworth, Norris, Tenn.

John F. Shanklin, Washington, D C.

Stephen H. Spurr, Ann Arbor, Mich.

Russell C. Stadelman, Memphis, Tenn.

John A. Zivnuska, Berkeley, Calif.

Eugene V. Zumwalt, Washington, D. C.

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Nominating Committee

For Fellow

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George B. Amidon, International Falls, Minn.

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Robert S. Campbell, New Orleans, La.

Nathan D. Canterbury, Houston, Texas.

R. R. Chaffee, Berkeley, Calif.

Donald E. Clark, Denver, Colo.

Edward C. Crafts, Chevy Chase, Md.

Kenneth P. Davis, Ann Arbor, Mich.

M. B. Dickerman, St. Paul, Minn.

Theodore W. Earle, Anderson, S. C.

Thomas C. Evans, Asheville, N. C.

Reginald D. Forbes, Ambler, Pa.

Louis J. Freedman, Old Town, Maine.

Ernest J. George, Mandan, N. Dak.

S. A. Graham, Ann Arbor, Mich.

Lewis R. Grosenbaugh, Berkeley, Calif.

Percy D. Hanson, Juneau, Alaska.

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Wallace I. Hutchinson, Sherman Oaks, Calif.

George M. Jemison, Washington, D. C.

Clemens M. Kaufman, Gainesville, Fla.

Henry R. Koen, Russellville, Ark.

Edward I. Kotok, Walnut Creek, Calif.

Charles J. Kraebel, Berkeley, Calif.

Fred H. Lang, Little Rock, Ark.

Julius A. Larsen, Ames, Iowa.

E. W. Littlefield, Delmar, N. Y.

H. J. MacAloney, St. Paul, Minn.

Henry J. Malsberger, Atlanta, Ga.

Ira J. Mason, Bethesda, Md.

Walter F. McCulloch, Corvallis, Ore.

William M. Oettmeier, Fargo, Ga.

Carl I. Peterson, Nashville, Tenn.

George R. Phillips, Chevy Chase, Md.

John A. Putnam, Leland, Miss.

A. B. Recknagel, Ithaca, N. Y.

John F. Shanklin, Washington, D. C.

Donald D. Stevenson, Foley, Fla.

Calvin B. Stott, Milwaukee, Wis.

Karl A. Swenning, Wallingford, Pa.

Ray F. Taylor, Juneau, Alaska.

Charles L. Tebbe, Missoula, Mont.

Allen E. Thompson, Seattle, Wash.

Albert E. Wackerman, Durham, N. C.

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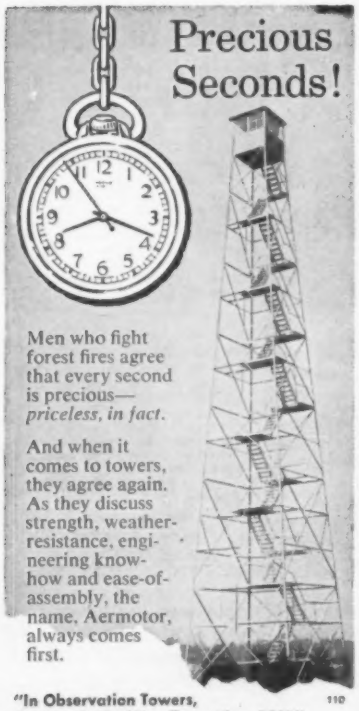
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Visiting Scientists Program in Forestry to be Continued

The National Science Foundation has granted the Society of American Foresters funds for continuing the Visiting Scientists Program in forestry for a two-year period 1961-1962 and 1962-1963. The yearly grant is for $15,075.

The objectives of the new program will be (1) to strengthen and stimulate forestry programs of colleges and small universities; (2) to provide staff and students of these colleges an opportunity for additional association with productive and creative scientists; and (3) to aid in the motivation of able college students toward careers in science and the teaching of science.

In carrying out the 1960-1961 program, 53 visits were made by 16 visitors (with 11 different specializations) to 46 institutions. Repeat visits were made to some schools where there seemed to be special need. The average length of visit was 2.6 days. Based on estimates furnished by recipient institutions, a total of 6,980 persons were reached in the following categories: faculty 790; undergraduate students 4,630; graduate students 570; public 990. Best attendance at public lectures took place when the occasion was arranged to coincide with SAF Chapter or Section meetings.

Upper Mississippi Valley Section Holds Summer Meeting

The summer meeting of the Upper Mississippi Valley Section was held in Grafton, N. D., and vicinity on August 10-11, 1961.

Don Duncan of the University of Minnesota School of Forestry, who is the new Section chairman, presided at the afternoon business session which was followed by a banquet with the new vice chairman Ernest George acting as toastmaster. The banquet speaker, R. D. McCulley of the Lake States Forest Experiment Station, reviewed the history and development of tree planting in North Dakota.

On the field trip on Friday a number of excellent single and multiple row shelterbelts and a Christmas tree planting were noted. A demonstration (with anemometers) of the effect of a single row planting of Siberian elm on wind velocity was given. Cultivation of trees with hay-rake tines and several different types of harrows was demonstrated.

Visits were made to a number of control dams constructed as a part of the Tongue River Water Protection-Flood Prevention Project which was described by Neil McClure, area conservationist with the Soil Conservation Service.

A number of members took advantage of an aerial flight arranged to view the Tongue River Project and a concentration of shelterbelts from the air.

At the noon smorgasbord on Friday, Dr. William Cram, superintendent of the Forest Tree Nursery at Indianhead, Saskatchewan, Canada, gave a brief description of tree breeding and planting in his area and James Cayford of the Forest Research Division of the Canadian Department of Forestry located at Winnipeg, Manitoba, described the work being carried on by this research division.

All of these North Dakota meetings are memorable for their western hospitality and carefully planned tours and this year's meeting was no exception. Although there was no rattlesnake meat this trip there were unique name plates fashioned out of Badlands juniper.

J. W. HUBBARD
Secretary-Treasurer

L. J. Leffelman (1893-1961)

L. J. Leffelman, 68, died recently in Columbia, S. C. Born February 1, 1893, Mr. Leffelman received his undergraduate degree in forestry from the University of Minnesota in 1923 and his Master degree from Yale School of Forestry in 1925.

He went to the White Estate in Stateburg, S. C., in 1928, becoming one of the first privately employed foresters in South Carolina. He served with the CCC from 1933 to 1935, and subsequently was employed by the Resettlement Administration (1935-1938), the Soil Conservation Service, and the U. S. Forest Service.

Membership Applications and Advancements

Proposals for admission, advancement, and reinstatement received in the Society office during the month of August are listed below.

Action on the eligibility of those proposed for membership as listed below will be taken by the Council as of Octo-

ber 31, 1961.

Communications from the voting members regarding the membership eligibility of these persons should be received in the Society office prior to that date.

Alaska Section

Junior Grade

Raynor, J. C., Forester, Ketchikan Ranger Dist., Ketchikan, Alaska. Univ. Wash., BSF, 1956.

Appalachian Section

Junior Grade

Hare, R. J., Wood Procurement Supv., Halifax Paper Co., Roanoke Rapids, N. C. N. C. State, BSF, 1950.

Member Grade

Chamblee, G. V., Forest Supv., Bladen Lake State Forest, Elizabethtown, N. C. (Reinstatement).

Central Rocky Mountain Section

Junior Grade

Bock, D. L., Recreation Forester, USFS, Delta, Colo. Colo. State, BSF, 1954.
Ronco, F., Forester, USFS, Fort Collins, Colo. Colo. State, BSF, 1951, MS, 1960.

Affiliate Grade

Jarrell, W. S., Asst. Ranger, USFS, Hill City, S. Dak.

Columbia River Section

Member Grade

McElroy, E. B., Forester, USFS, Seneca, Ore. Mich. State, BSF, 1956 (Junior 1956).

Gulf States Section

Junior Grade

Students Eligible for Automatic Advancement

LOUISIANA POLYTECHNIC INSTITUTE

Covington, P. H.	Troquille, B. M.
Rowell, G. D.	Underwood, P. N.
Taylor, J. M.	Wilkerson, A. H.

Inland Empire Section

Member Grade

Pitkin, F. H., Nursery Supt., Univ. of Idaho. Moscow, Idaho (Reinstatement).

Intermountain Section

Junior Grade

Benson, R. E., Research Forester, Intermountain Forest & Range Expt. Sta., Ogden, Utah. Univ. Minn., BSF, 1958, MF, 1960.

Member Grade

Brown, B. G., Forester, USFS, Salmon, Idaho. Mich. State, BSF, 1956 (Junior 1956).

New England Section

Affiliate Grade

Telfer, E. S., Consulting Forester, Caledonia, Queens Co., Nova Scotia, Canada.

Puget Sound Section

Junior Grade

Erickson, T. R., Forest Mgmt. Forester, Dept. of Natural Resources, Forks, Wash. (Affiliate 1958).

Southeastern Section

Student Grade

UNIVERSITY OF GEORGIA

Coleman, D. T.	Purcell, K. L.
McDonald, J. L.	Tobias, R. C.
Phillips, J. H.	Weeks, S. A.

Junior Grade

Martin, C. H., Land Mgr., Brunswick Pulp & Paper Co., Dry Branch, Ga. (Reinstatement).
McDonald, J. A., Charge of Land Mgmt., Atlantic Creosoting Co., Savannah, Ga. (Reinstatement).
Thrash, R. D., Consultant Forester, Butler, Ala. (Reinstatement).
Weston, S. J., County Farm Forester, Fla. Forest Service, Brookville, Fla. (Reinstatement).

Student Eligible for Automatic Advancement

UNIVERSITY OF FLORIDA

Johnson, J. P.

Member Grade

Smith, D. E., Asst., Auburn Univ., Auburn, Ala. Auburn Univ., BSF, 1955 (Junior 1955).

Affiliate Grade

Clements, R. W., Naval Stores Specialist, Lake City Research Center, Olustee, Fla. (Reinstatement).
Wawriw, R. M., Forestry Eng., Puerto Rico Water Resources Authority, Hato Rey, Puerto Rico.

Southwestern Section

Member Grade

Schultz, D. A., Dist. Ranger, USFS, Clouderoft, N. Mex. (Junior 1955).

Affiliate Grade

Stone, P. A., Forester, USFS, Happy Jack, Ariz.
Williamson, R. M., Dist. Ranger, USFS, Happy Jack, Ariz.

Upper Mississippi Valley Section

Junior Grade

Goebel, C. J., Asst. Prof., Iowa State Univ., Ames, Iowa. Idaho State, BSF, 1955.

Wisconsin-Michigan Section

Junior Grade

Camp, R. F., Asst. Dist. Forester, Wis. Cons. Dept., Janesville, Wis. (Affiliate 1956).

No Section

Junior Grade

Boyett, J. E., Lt., George AFB, Calif. (Reinstatement).

Corresponding Grade

G. K. Chandrathil, Indian Forest Service, Kurichy, Kottayam, Kerala State, India.
Antonio Gonzalez Garcia-Gutierrez, Chief of Section, Spanish Forest Service, Lerida, Spain.
Mariano Melendo Garcia-Serrano, Sectional Chief, Dept. of Agric., Madrid, Spain.
Jesus-Maria Pena Urmeneta, Sectional Chief, Dept. of Agric., Madrid, Spain.
Fernando Nicolas Isasa, Sectional Chief, Dept. of Agric., Cuenca, Spain.
Javier Moro, Consulting Forester, Madrid, Spain.
Jose Ferrando Pla, Sectional Chief, Dept. of Agric., Madrid, Spain.
Abdul M. M. Salih, Asst. Specialist, Iraqian Gov., Baghdad, Iraq.
Lorenzo Garay Sandoval, Forest Eng., Gov. of Chile, Valparaiso, Chile.
Jose Joaquin Pena Urmenta, Sectional Chief, Dept. of Agric., Madrid, Spain.
Hoang Vu, Student, N. C. State College, Raleigh, N. C.

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National Outlook

Rumor Scotched. *National Outlook* tries to report factual and verifiable information only. During the past summer rumors—possibly influenced by the Dog Days—were circulating in Washington and elsewhere that Richard E. McArdle was about to retire as chief of the Forest Service. Asked by a member of the editorial staff of the JOURNAL OF FORESTRY whether the rumor was true, Dr. McArdle said, "Nothing to it." He intends to stay on.

Water Resources Planning. Bills entitled "Water Resources Planning Act of 1961" appeared to be heading into squabbles over committee jurisdiction following their introduction in Congress in mid-July. The proposals would declare it to be the policy of Congress that "the conservation, development, and utilization of the water and related land sources of the United States shall be planned and conducted on a comprehensive and coordinated basis with the cooperation of all affected federal agencies, states, local governments, and others concerned." Senator Clinton P. Anderson of New Mexico introduced S.2246, which he termed "the President's water resource bill," based on recommendations of the Senate Select Committee on Water Resources. Similar bills were introduced in the House.

The proposed legislation would establish a Water Resources Council consisting of the Secretaries of Agriculture, Interior, Army, and Health, Education, and Welfare. With the help of a professional staff, the Council would pass on water resource proposals, and forward its recommendations through the President to Congress. It would be authorized to set up river basin commissions, on the request of state governors in areas involved. Loans could be made to states for water resource planning. The Council itself would not be authorized to carry out projects, but with its authority to establish priorities it could exercise a considerable amount of control over what projects might be undertaken.

Senator Anderson's bill was referred to his Senate Committee on Interior and Insular Affairs. Senator Case of South Dakota, however, said he wanted his Public Works Committee to hold hearings on it. Finally, the two committees held joint hearings. In the House the bills were referred to the House Committee on Public Works, but Representative Aspinall of Colorado was clamoring for his Interior Committee to handle them. Unless the interested committees could reach agreement, it looked as if the "Water Resources Planning Act of 1961" might still be pending in Congress in 1962.

Water Pollution Act. A more vigorous attack on water pollution is in prospect under the Federal Water Pollution Control Act (Public Law 87-88) adopted by Congress and signed by the President in July. The new act increases the annual authorization for federal grants to municipalities for construction of waste treatment plants from the former maximum of $50 million to $80 million for fiscal 1962, $90 million for 1963, and $100 million for each of the following four years. Federal law enforcement authority is extended to all navigable waters, intrastate as well as interstate. The measure also provides for research grants and regional research laboratories.

Under an earlier act (1956), the federal water pollution control program has been carried on by a division in the U. S. Public Health Service in the Department of Health, Education, and Welfare. The new act makes the Secretary of HEW directly responsible for administering the program, which might be considered a congressional directive that the work be upgraded. Secretary Ribicoff now has a departmental committee studying the organization question. Meanwhile he has asked the Surgeon General to continue administering the program, and the Public Health Service is increasing its pollution control activity. Eventually, water pollution control may be combined with work on air pollution and other environmental problems in a separate agency in HEW.

Foreign Trade. The United States exported 860.6 million board feet of lumber last year, an increase of some 73 million feet over the preceding year. The 1960 total included 687.9 million feet of softwood and 136.2 million feet of hardwood. Also included were 36 million feet of sawed railroad ties and one-half million feet of box shooks. Douglas-fir was the leading export species.

Imports of lumber far exceeded exports. Total imports for 1960 were 3,913.9 million board feet, of which more than 90 percent was softwood. First-ranking import species was spruce, followed closely by Douglas-fir; they accounted for more than half of all lumber imports. Canada was the leading source.

In dollar value, U. S. shipments abroad of lumber and wood manufactures in 1960 amounted to $193 million. Foreign customers bought $410 million of U. S. pulp and paper products. Although exports of forest products represent a relatively small proportion of total U. S. production, they help to provide employment and to keep the industry operating at a higher level.

These foreign trade figures were reported by the Forest Products Division of the Business and Defense Services Administration, U. S. Department of Commerce, from data of the Bureau of the Census.

Export Expansion Program. Forest products are receiving attention in the export expansion program of the Department of Commerce. James M. Owens, director of the Forest Products Division, BDSA, predicts that the decade before us will bring new and greater export opportunities to American forest products industries. At a world forest products trade seminar at Oregon State College this summer, Mr. Owens said that "ever increasing export opportunities are arising out of the population explosion around the world and out of the growing drive of people everywhere toward an improved standard of living and a better education." He pointed out that housing and paper are basic to the attainment of these goals. The Department of Commerce is working for the removal of barriers in other countries to U. S. exports. It publishes reports of foreign requests for U. S. goods and lists of foreign firms handling specific commodities, and provides other services to U. S. exporters.

Logs to Japan. With the Japanese economy rapidly expanding—gross national product rose by about 10½ percent last year—Japan looms as an increasingly important market for American forest products. Exports of Pacific Northwest softwood lumber to Japan nearly

doubled between 1955 and 1960, and in the first three months of this year increased 65 percent over shipments in the same period last year. To help meet the needs of its building boom, Japan also has been procuring logs in the Northwest for processing in its own mills. Several West Coast mills, together with spokesmen for labor organizations, have protested that this is raising the price of logs here, and that it could result in Japanese processed lumber from American forests competing in U. S. markets. So far, however, it appears that the lumber is all being used in Japan, and that the Japanese are taking many logs that would not otherwise be salable in the Northwest.

Newsprint Consumption. For the first six months of 1961, consumption of newsprint in the United States was 2.6 percent lower than in the same period last year, according to the American Newspaper Publishing Association. Consumption in 1960 reached record highs.

More Money. Federal forestry agencies fared well in the appropriation bills passed by Congress for fiscal 1962. The Forest Service received a total of $209,128,000 in regular funds, an increase of more than $48 million over 1961 funds. Substantial increases were granted for national forest planting and stand improvement, recreation, and fire protection, and for forest research construction. Cooperative fire control and pest control each got boosts of over $2 million.

The Soil Conservation Service received a total of $178,680,000 for 1962, including $54,787,000 for watershed protection and $25 million for flood prevention work. The Bureau of Land Management received $33,400,000; National Park Service was granted $105,700,000; Fish and Wildlife Service $51,500,000.

Stepped-up Research. Manufacturers of pulp and paper are stepping up their research activities. The *New York Times* reports that present research spending in the industry is estimated at about $60 million a year, a fourfold increase over the level of ten years ago. Several companies are opening new research centers or expanding facilities this year, including the Mead Corporation's new $4,500,000 center in Chillicothe, Ohio; the Scott Paper Company's $5 million unit in Philadelphia; and a $3,500,000 technical center under construction by the St. Regis Paper Company in Clarkstown, N. Y. Industry research programs range from forest genetics to the requirements of frozen food packaging. Since production costs have been climbing while paper prices remained relatively steady, much effort is being directed toward reducing costs of making products and the development of new products and markets.

Research Facilities. A $4,120,000 increase in the appropriation to the U. S. Forest Service for forest research construction in 1962 includes funds earmarked for new or improved research facilities at Fairbanks, Alaska; St. Paul, Minn.; Flagstaff, Ariz.; Bend, Ore.; Laramie, Wyo.; Bluefield-Princeton, W. Va.; Athens, Ga.; Bozeman, Mont.; and Crossett, Ark.

Small Woodlands Proposals. Forest industry's recommendations for dealing with problems of small woodland owners were presented by the Forest Industries Council (American Pulpwood Association, National Lumber Manufacturers Association, American Paper and Pulp Association) when the Council's representatives met with Frank J. Welch, Assistant Secretary of Agriculture, this summer. The industry group favored programs based on economic growth rather than a "crash program" of federal action. It recommended that duplicating programs be eliminated, and that more emphasis be placed on education. Also recommended were a study of incentive taxation, review of basic forest research, and improved productivity of federal and state forest lands. The group proposed that federal forest resource surveys, in cooperation with state and private interests, be made every ten years.

BLM Sesquicentennial. The old General Land Office, predecessor of the Interior Department's Bureau of Land Management, came into being in 1812. Next April 25, the 150th anniversary of its establishment will be commemorated at a special observance in the Statler-Hilton Hotel in Washington, D. C. For more than a century the General Land Office was concerned mainly with getting rid of public lands. Hundreds of millions of acres went into private ownership through homesteading, patenting, land grants, and other procedures. National forests and parks were created through reservation of public domain lands. But after a century of "land office business" a sizable chunk of unappropriated and unreserved public land still remained. The Bureau of Land Management, formed when the General Land Office was merged with the Grazing Service in 1946, today is managing 477 million acres, including some 265 million acres of unreserved public lands in Alaska.

A Public Domain Sesquicentennial Commission, which includes representatives of the Society of American Foresters and a number of other organizations, is arranging the anniversary observance.

New Name. The Department of the Interior is now referring to the public domain lands under its administration as the "national land reserve."

Simpler Grade Names. A Special Subcommittee on Grade Simplification and Standardization has worked out a simplified system of grade names and basic grade descriptions for softwood lumber, according to the National Lumber Manufacturers Association. H. T. Sharpe, chairman of the subcommittee, said that when accepted and implemented by the industry the simplified and standardized system could result in great benefit to the National Wood Promotion Program, through unified grade names, quality, and use recommendations. Recommended were:

Three appearance grades—"Prime," "Quality," and "Character."

Two board grades—"Standard" and "Utility." (An economy or cutting grade also was recommended which would have little or no use in residential construction.)

Four grades for two-inch dimension—"Structural," "Standard," "Utility," and "Economy."

Two stud grades—"Standard," usable throughout house construction for all purposes; and "Utility," usable for exterior bearing walls in one-story construction and interior non-load-bearing partitions.

The subcommittee's recommendations were sent by NLMA to the principal softwood grading agencies for review and approval.

Equal Employment. A new chapter added to Title 41 of the Code of Federal Regulations calls for equal employment opportunity on all government contracts for all qualified persons without regard to race, creed, color, or national origin. The regulations apply to timber sale contracts on national forests and BLM lands. Exemptions may be granted when in the "national interest."

Cape Cod Seashore. President Kennedy on August 7 signed into law (P.L. 87-126) S. 857, establishing the Cape Cod National Seashore in Massachusetts. To be administered by the National Park Service, the area includes 26,670 acres.

Letters

Displaying The Code

It is my personal desire to develop in undergraduate students a full appreciation of professionalism. It has occurred to me that another way of doing this would be to have the Foresters Code of Ethics displayed in the front of each of our classrooms. I would therefore appreciate your sending me two copies of the Code of Ethics suitable for framing. If there is a charge, please bill me personally. I will have them suitably framed and displayed in our classrooms prior to the beginning of the fall quarter in September.

W. B. DEVALL
Auburn, Ala.

New Departments

Just a note of commendation on the new addition to the JOURNAL—The National Outlook. I like it very much and hope you continue it. I think it is something the JOURNAL has needed.

ERNEST F. SWIFT
Rice Lake, Wis.

The new JOURNAL additions, "National Outlook" and "Letters," were viewed with hearty approval by the foresters of my office.

WALTER P. BEMIS
Sacramento, Calif.

. . . the two page spread on National Outlook was very good. I have had a couple of favorable comments from here, but even more favorable comment to see the Letters to the Editor section beginning.

O. F. HALL
Lafayette, Ind.

The National Outlook section of the JOURNAL is an excellent addition.

JOHN R. CURRY
Saranac Lake, N. Y.

5-Year Curriculum

As one who has advocated a five-year curriculum for the first degree in professional forestry, I feel I should rise to the bait of Professor Roberts' dissent in the August 1961 JOURNAL. Nevertheless, I find I cannot disagree with him, in principle. In practice, however, I doubt that many secondary schools, especially among those whose graduates turn to forestry, can graduate students who can satisfy Professor Roberts' high requirements for entrance to the forestry curriculum. In other words, his dissent from the five-year B.S. proposal seems to me, in effect, an endorsement of it in the context of our present secondary education.

I join Professor Roberts in the hope that our secondary schools will learn how to give their more able students an education which will enable them to bypass much of the frankly remedial instruction with which our universities are often forced to dilute the freshman and sophomore years. I agree that our professional schools can well exert pressure to this end.

JOHN W. DUFFIELD
Nisqually, Wash.

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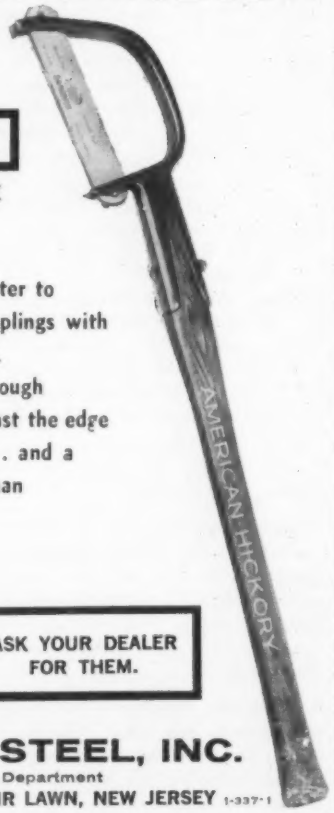

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Thomas Eugene Avery, Michigan State University

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FIELD PLOT TECHNIQUE
Erwin L. LeClerg, United States Department of Agriculture
Warren H. Leonard and Andrew G. Clark, Colorado State Univ.

Completely revised, this edition is both a student text and a researcher's reference manual. Practical aspects of statistical procedures, detailed examples of analysis are included . . . the book brings together and explains simply as possible the general principles, techniques, assumptions and guides to procedures applicable to field experimentation. January 1962; about 350 pages; price open.

ILLUSTRATED GENERA OF WOOD DECAY FUNGI
Charles L. Fergus, Pennsylvania State University

The dual purpose of this manual is to help the general forester identify wood decay fungi and to provide an illustrated key for use in a forest pathology laboratory. The keys, based on those developed by the late Dr. L. O. Overholts, have been changed and expanded to accommodate new genera and changes in nomenclature. Illustrations of each genus are included. 1960; 135 pages; $4.00

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Forestry News

CIF Names New President

Lowell Besley, chairman, Woodlands Department, Pulp and Paper Research Institute of Canada, has been elected president of the Canadian Institute of Forestry, national body of professional foresters, according to its recent announcement.

He went to Canada in 1948 as head of forestry at the University of British Columbia and became its first Dean of Forestry in 1950. He joined the Pulp and Paper Research Institute in his present position in 1956. Active in CIF since 1949, he has served as a section chairman (Vancouver 1950), director (1951, 1959-1961), and vice president (1959-1961). He participates in many other organizations including Woodlands Section CPPA, Association B.C. Foresters, Forest Biology Committee of TAPPI, Empire Forestry Association, Society of American Foresters, Forest Products Research Society, and advisory groups of the Laval Forest Research Foundation, Ontario Research Foundation, and 1961 Resources for Tomorrow Conference.

Mr. Besley, a native of Maryland and a graduate in forestry of Cornell (B.S. 1931) and Yale (M.F. 1932), has been a research forester in the Maryland Department of Forestry, Duke Forest, Northeastern and Southeastern Forest Experiment Stations, U. S. Forest Service, Pennsylvania and West Virginia Experiment Stations; college professor in forest measurements, economics, and finance (Penn State 1934-1937, West Virginia University 1937-1948, University of British Columbia 1948-1953); naval officer (Lt. Comdr., U. S. Naval Reserve—Pacific 1942-1946); forest management consultant (British Columbia 1949-1952); association manager (executive director-forester, American Forestry Association 1953-1956); forest operator (Besley & Rodgers, Inc. 1960—); and author of a textbook, bulletins, and numerous articles.

Florida Governor Activates Board of Foresters

Governor Farris Bryant on August 16 activated the State Board of Registration for Foresters, which was created by the 1961 legislature.

Appointed to the five-member board were Herbert Attaway of Lake City; Kenneth Swinford of Gainesville; C. H. Coulter of Tallahassee; George W. Mosely and Frank A. Albert, both of Jacksonville.

LOWELL BESLEY

Alabama Registration Board Elects Officers

The State Board of Registration for Foresters has elected new officers to serve on its licensing board for 1961-1962, effective October 1.

David E. Hampe, chief forester with the TCI Division of the U. S. Steel Corporation in Birmingham, was named chairman. J. M. Stauffer, state forester, State Conservation Department, Montgomery, was named vice chairman; and Wilbur B. DeVall, Auburn Forestry Department head, was elected secretary.

Other Board members are John C. Mitchell, Tributary Area Development, TVA, Florence; and R. V. Miles, Jr., vice president, Natural Resources and Public Affairs, Gulf States Paper Co., Tuscaloosa.

Ten foresters were approved for license at the regular meeting in Montgomery. Alabama's number of registered foresters now stands at 337.

U. S. railroads spent $96,553,000 for lumber and other forest products in 1960 against $92,612,000 in 1959, according to the Association of American Railroads. Purchases of cross ties totaled $51,284,000 as compared with $43,761,000 in 1959.

Class I railroads increased the amount of materials and supplies purchased during 1960, despite the fact that their revenues were down.

Private & Industrial

Bowaters Southern Presents Recreation Area to State of Georgia

High Falls Lake, a scenic waterfall, and 80 acres of adjacent woodlands were presented to the State of Georgia by Bowaters Southern Paper Corporation in ceremonies held at High Falls, near Jackson, on July 25.

Over 600 guests attended and heard Governor Vandiver, in accepting the Bowaters gift, describe it as being "indicative of its (Bowaters') desire to serve the community in which it is located and the people who live here—I can think of no greater gift of good citizenship than the one being witnessed here today."

Other speakers were R. R. Edgar, president of Hiwassee Land Company; V. J. Sutton, vice president and general manager, Bowaters Southern Paper Corporation; and Fulton Lovell, Georgia game and fish director.

RRCC Secretary-Manager

Walker B. Tilley, Redwood Region Conservation Council secretary-manager, Santa Rosa, Calif., has resigned his interim position effective in August, according to Roy G. Wagner of Ukiah, Council president.

Fred Landenberger, California Redwood Association forester, Eureka, Calif., resigned from CRA to succeed Tilley, Wagner said. Landenberger, also secretary-manager of the Redwood Region Logging Conference, assumed his new RRCC duties immediately.

Tilley has had a career spanning more than 40 years in the forest industry, having served in years past as chief forester for Albion Lumber Company; managing forester, Willamette Valley Tree Farms; forester, Western Pine Association; forester, West Coast

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Lumbermen's Association; managing forester, forest industries of Travancore, India; and most recently, up to his retirement in 1959, chief forester, Masonite Corporation, Ukiah.

International Plants 36 Million Trees

More young tree seedlings were planted on International Paper Company lands in the South during the 1960-1961 planting season than ever before in the history of the Southern Kraft Division, according to J. E. McCaffrey, vice president and assistant general manager in charge of Woodlands Operations.

McCaffrey said International Paper Woodlands personnel planted some 36,468,000 seedlings on 54,860 acres of Company land, exceeding the original planting estimate by almost 1½ million seedlings and bringing the total number of seedlings planted in the last ten years to more than 218 million.

In addition, the Company distributed more than two million seedlings, free of charge, to various school and youth groups throughout the South. He said many of the pulpwood dealers also conducted free seedling programs for landowners in their areas.

Purdue Forester Named Comptroller of Forestry Suppliers, Inc.

Gary D. Schlaeger, of Gary, Ind., a graduate of the Department of Forestry and Conservation, Purdue University, has been named comptroller of Forestry Suppliers, Inc., of Jackson, Miss., according to James W. Craig, president and general manager.

Mr. Schlaeger, who took over his new duties in August, also holds an M.S. degree in business administration from Indiana University.

The Value of Pulpwood to the South

The value of pulpwood produced in the South as raw material for the pulp and paper industry reached an all-time high of $471,020,000 in 1960, an increase of 4 percent over 1959, according to H. J. Malsberger, general manager of the Southern Pulpwood Conservation Association in Atlanta.

This value was based on a 12-state pulpwood production survey by the U. S. Forest Service Experiment Stations in Asheville, N. C., and New Orleans, La., in cooperation with SPCA.

Georgia led the South for the thirteenth straight year with total purchases of pulpwood valued at $98,116,000. Alabama was second with a crop valued at $60,394,000.

Pulpwood harvest values for the other southern states follow: Arkansas, $31,118,000; Florida, $42,008,000; Louisiana, $37,138,000; Mississippi, $39,472,000; North Carolina, $45,472,000; Oklahoma, $1,062,000; South Carolina, $43,308,000; Tennessee, $7,236,000; Texas, $28,528,000; and Virginia, $36,668,000.

The South's pulpwood harvest last year, Mr. Malsberger stressed, was not only 57 percent of the nation's total but also was greater than that of any other area of comparable size in the world.

GLENN R. ALLISON

Public

Allison Promoted to Assistant Regional Forester

Glenn R. Allison has been promoted to the position of assistant regional forester of the Eastern Region, U. S. Forest Service, at Upper Darby, Pa. He will direct cooperative forestry programs with the 14 states in the Region.

Allison is a graduate of Purdue University and served in the U. S. Army at the Field Artillery School, Fort Sill, Okla., and in the Philippine Islands during World War II. After graduating from college in 1936, he was employed as a forester in a Civilian Conservation Corps encampment in Indiana and later engaged in blister rust control in Michigan.

After his release from military service in 1946 Allison was employed by the Forest Service in Michigan. In 1950, he transferred to the Eastern Region where he supervised the white pine blister rust eradication program in Vermont, Massachusetts, Connecticut, and Rhode Island. Since 1954 he has served in a supervisory capacity in the Division of Forest Pest Control at the headquarters of the Region.

J. W. McElroy Transferred

Jack W. McElroy, U. S. Forest Service employment development officer, Regional Office, Atlanta, Ga., transferred in August to the San Francisco Regional Office, as chief of the new Employee Development and Safety Branch, Division of Personnel Management, according to Regional Forester Charles A. Connaughton.

McElroy will direct employee development and public safety programs for both on and off-the-job training of U. S. Forest Service personnel.

A graduate of Iowa State University, McElroy began his professional career with U. S. Forest Service on the Ozark National Forest in Arkansas in 1949. He is a veteran of World War II and the Korean campaign.

Lake States Pathologist Appointed

John H. Ohman, forest pathologist, has been appointed to the staff of the Lake States Forest Experiment Station to undertake research on the diseases of northern hardwoods.

On completion of the Station's new building at Marquette, Mich., Dr. Ohman will be located there. The building and its facilities are being developed specifically for work on northern hardwood management and disease problems.

Dr. Ohman served in the Army from 1951 to 1954 with service in Korea and Japan. In 1957 he received a B.S. degree in forestry, in 1958 an M.S. degree in plant pathology, and in 1961 a Ph.D. in the same subject from the University of Minnesota. From that time until his appointment to his position with the Station, he was a research fellow on the staff of the Plant Pathology Department at the University of Minnesota.

Supervisor Promoted, Successor Named

Ross W. Williams of the U. S. Forest Service Regional Office, Portland, Ore., has been named supervisor of the Gifford Pinchot National Forest, with headquarters at Vancouver, Wash., it has been announced by J. Herbert Stone, regional forester.

Williams succeeded C. Glen Jorgensen, who was promoted to auditor-in-charge for four western regions of the Forest Service. Jorgensen will be assigned to the chief's office, but will work out of Portland.

Jorgensen has been supervisor of the Gifford Pinchot National Forest since 1957. Williams has been special assistant to the regional fire control chief

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since 1958. A 1938 graduate of Oregon State University, Williams began seasonal work for the Forest Service in 1936. Jorgensen is a 1939 graduate of Washington State University and began seasonal work with the Forest Service in 1937.

Park Service Forester Promoted

George W. Fry has recently been appointed chief of operations in the National Park Service's regional office in Omaha, Nebr. After tours of duty on the ranger staffs of several national parks, Fry became assistant superintendent of Everglades National Park in 1954 and superintendent of Isle Royale National Park in 1959. He is a forestry graduate of Pennsylvania State University.

California Foresters on Watershed Assignments

Regional Forester Charles A. Connaughton of the U. S. Forest Service has announced the transfer of assistant supervisor William E. Murray from the Toiyabe National Forest in Nevada to the Regional Office in San Francisco. Murray was promoted to chief of the Branch of Cooperative Watershed Management and Flood Control in the California Region's Division of Watershed Management in August.

Murray graduated in forestry from Utah State University in 1941, entered the Navy in 1943, and served as a lieutenant on motor torpedo boats in the South Pacific during World War II.

He has worked for the Forest Service in Utah, Wyoming, and northern Idaho. He was district ranger on the Sawtooth National Forest and fire control officer on the Boise National Forest in Idaho. He has been assistant supervisor of the Toiyabe National Forest since 1960.

The transfer and promotion of Alan J. Lamb and Vincent W. Twoomey to new positions in the Division were also announced.

Lamb will become branch chief of Multiple Use and Watershed Management while Twoomey will fill a forester position in the Branch of Cooperative Watershed Management and Flood Control.

Lamb has been regional training officer since 1958. Previously he served in various forester positions starting on Routt National Forest in Colorado in 1948. A graduate of Colorado State University, he was awarded a Conservation Fellowship in 1957 and received a Master degree in public administration at Harvard University in 1958.

Twoomey is a graduate of Cornell University School of Forestry, and has worked for the Soil Conservation Service, the U. S. Forest Service's Great Plains Shelterbelt project, Emergency Rubber project, and Small Watersheds programs. His most recent assignment has been on the Angeles National Forest where he served as forester in charge of watershed management and flood control.

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Schools

Duke Professor Retires

Professor Francis X. Schumacher retired as professor of forestry at Duke University in August.

Internationally known for his pioneer work in the application of statistics to forestry, Professor Schumacher was the recipient in 1959 of the Society of American Foresters' Award for Achievement in Research. He is a fellow of the American Association for the Advancement of Science and of the American Statistical Association. He has been honored by the Appalachian Section of the SAF with its senior achievement award and by an honorary Doctor of Science degree from North Carolina State College.

Dr. Schumacher is co-author with Donald Bruce of the book *Forest Mensuration* and with R. A. Chapman of *Sampling Methods in Forestry and Range Management*. He is a contributor to numerous scientific journals and was associate editor of the JOURNAL OF FORESTRY 1936-1945.

During World War I Captain Schumacher was cited with the Belgian Legion of Honor, the French Croix de Guerre, the Purple Heart, and the Distinguished Service Cross.

A 1921 forestry graduate of the University of Michigan, he studied for two years at the University of California and was on that school's faculty 1921-1930. In the latter year he joined the U. S. Forest Service, and then, in 1937, the Duke faculty.

Dr. Schumacher has been named a special consultant to the firm of T. S. Coile, Inc., forest land consultants of Durham, N. C. He will also, next year, spend six months at the University of Stellenbosch in South Africa doing research on the growth of forest plantations.

Joins SIU Faculty

Ernest A. Kurmes, an assistant silviculturist in the Yale University School of Forestry, New Haven, Conn., was recently named to the Southern Illinois University forestry department faculty by the SIU board of trustees. He will be an assistant professor of silviculture.

Kurmes was awarded his doctorate in June 1961 from Yale University, where he also received the Master of Science and the Master of Forestry degrees. In addition to assistantships in forestry at Yale, he has worked as a forestry aid for the Northeastern Forest Experiment Station of the U. S. Forest Service at Bartlett, N. H.

Kurmes replaces Dr. John F. Hosner, who recently resigned to take the chairmanship of the forestry department at Virginia Polytechnic Institute, Blacksburg, Va.

Minnesota Professor Granted Fulbright Lectureship

Merle P. Meyer, associate professor of forestry at the University of Minnesota, has been awarded a Fulbright lectureship to Norway, according to an announcement by Frank H. Kaufert, director of the University's School of Forestry.

Meyer will be on leave from the School of Forestry through June 1, 1962. He will headquarter at the School of Forestry Agricultural College of Norway, Vollebekk. He will study the forests of Norway and the applications of aerial photography to forest classification, forest inventory and forest mapping in Norway, Sweden, and Finland.

During the final phase of his project he will present course work in applications of aerial photography at the School of Forestry, Vollebekk, Norway.

Maryland Appoints Research Forester

Dr. L. Eugene Cronin, director of the Natural Resources Institute of the University of Maryland, has announced the appointment of John B. Genys as forest biologist in the Institute.

Dr. Genys, born in Lithuania, received the degree Diploma Forest Manager from Georgiae-Augustae University, School of Forestry, Hanover-Münden, Germany, in 1949 and earned the Ph.D. degree at Michigan State University, Department of Forestry, in 1960. He continued postdoctoral studies at the University of Wisconsin.

Prior to his present appointment, Dr. Genys was on the staff of the Lake States Forest Experiment Station,

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JOHN B. GENYS

Northern Institute of Forest Genetics, assisting in forest genetics research, and worked as a graduate research assistant in genetics and soils at Michigan State University. As a research fellow under the Fox Trust Fund for Forest Research he has conducted studies on geographic variation in European larch. He was most recently instructor in the Department of Soils, Section of Forest Soils, University of Wisconsin.

He is a member of Xi Sigma Pi, the Society of American Foresters, and the American Association for the Advancement of Science. In Maryland, where he replaces Craig D. Whitesell who is now at North Carolina State College, he will supervise the forest research of the Institute, with emphasis on forest genetics and soil site studies. His office is in the State Office Building, Annapolis, Md., where his work is part of the Inland Research Division of the Institute.

National Science Foundation Grant for Research at Purdue University

A National Science Foundation grant of $24,900 has been received by Arthur H. Westing, assistant professor of forestry in the Department of Forestry and Conservation at Purdue University. The grant is for a three-year study of "The Physiological Mechanisms of Geotropic Responses." The research in general will study the hormonal changes accompanying geotropic stimulation, and an attempt will be made to isolate and analyze the endogenous growth regarding substances active in this process.

This project is part of a basic research in the department on physiology of forest trees. A program of research and graduate study was started two years ago.

SAF Consulting Foresters Directory to be Published

Persons and firms listed in the SAF Consulting Foresters Directory published in the January 1961 JOURNAL OF FORESTRY have been requested by mail to approve, correct, or revise their listings for the new directory to be published in the January 1962 JOURNAL.

Members doing consulting forestry work and whose names have not previously appeared are invited to apply now for listing. They should provide complete information following the form used in the List of Consulting Foresters published in the January 1961 JOURNAL OF FORESTRY. Society membership is a prerequisite for listing. Such members must be in good standing, i. e., have paid their 1961 dues. Consulting firms will be listed if one or more of the partners or employees are members of the Society.

November 1, 1961 is the last date on which listings will be accepted for publication in the January 1962 directory.

Forestry Employment

S.A.F. members are privileged to insert one 60-word advertisement in this column without charge. Forest industries desiring to employ foresters may insert advertisements at the rate of $4 per column inch. Copy must be received by the end of this month for an advertisement to appear in the issue after next.

Obviously the Society cannot assume responsibility beyond making it possible for prospective employee and employer to enter into negotiations.

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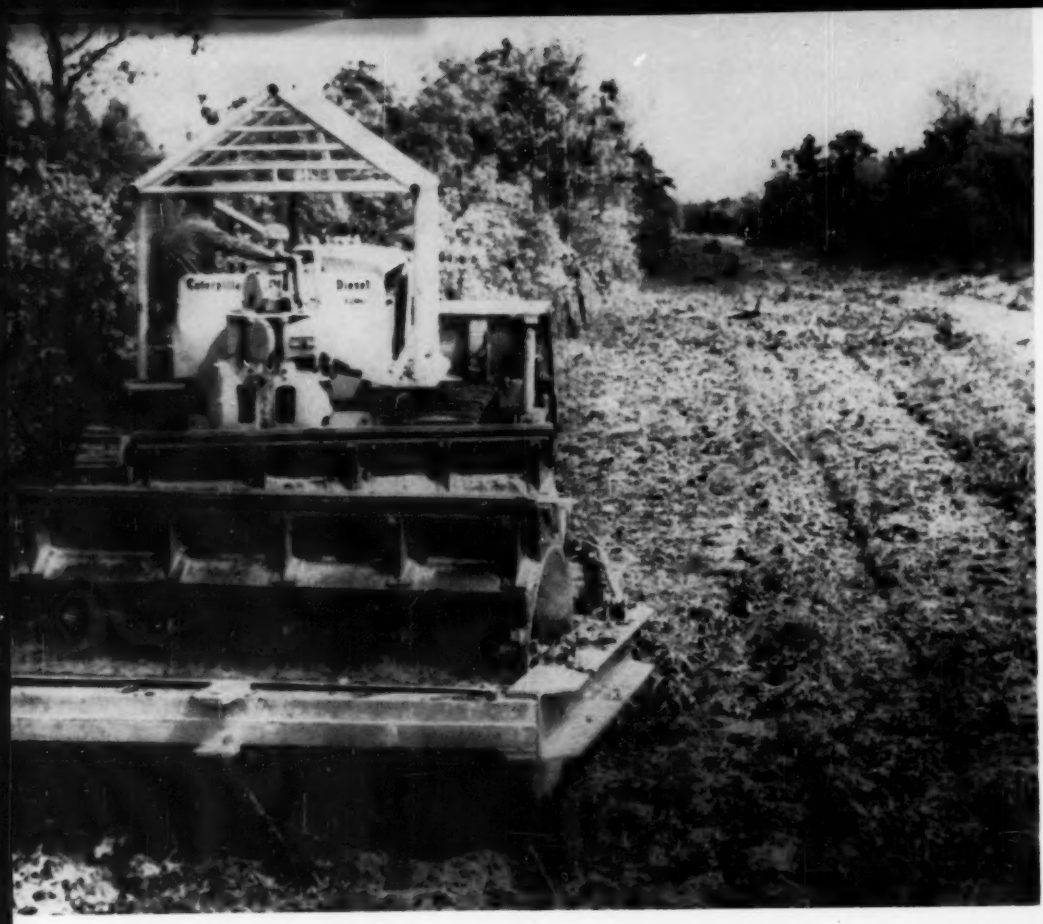

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